Manchester One
53 Portland Street

Energy Statement
RIBA Stage 3

KAIZEN
Consulting Engineers
Decarbonised

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Planning Policy	Building Extension	Tower Window Replacement

Reference	Energy Statement – RIBA Stage 3
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Date	3rd February 2026
Version	03 – revised for planning submission

Summary

This statement has been compiled to support the Manchester One development, setting out the approach to energy and results of predictive modelling assessments.

Where viable, the development aims to align with planning policy and Net Zero aspirations. This statement addresses the proposed building extension and the tower window replacement separately. Key results are summarised below.

Building Part	Space Heating Load (kWh)	GIA (m^2)	Space Heating Demand Intensity (kWh/m^2.yr)
New	37,440	2,812	13.3
New + Refurbished	49,910	3.025	16.5

Table 1. Space heating demand (Extension)

Iteration	Gas (MWh/yr)	Elec (MWh/yr)		EUI (kWh/m^2.yr)	CO_{2e} (tonnes./yr)	
	Reg.	Unreg.	Reg.		Unreg.	Reg
Baseline	287.9	152.2	152.4	195	26.9	79.5
Proposed	0	152.2	159.0	102	26.9	28.1
Diversified	0	86.1	145.0	76	15.2	25.7

Table 2. Predicted operational energy consumption and CO_2 emissions (Extension)

Iteration	Gas (MWh/yr)	Elec (MWh/yr)		,EUI (kWh/m^2.yr)	CO_{2e} (tonnes./yr)	
	Reg.	Unreg.	Reg.		Unreg.	Reg
Baseline	441.4	653.4	1,157.0	166.	115.6	285.4
Proposed	375.1	653.4	1,124.1	158	115.6	267.5
Future	0	653.4	1,028.1	124	115.6	182.0
Diversified	0	285.8	1,005.4	95	50.6	178.0

Table 3. Predicted operational energy consumption and CO_2 emissions (Tower)

Summary

The proposed scheme aims to align with policy and the wider aspirations of Net Zero.

Policy	Approach
ADL2: 2021	New and retained thermal elements will achieve the U-value standards set out within the approved document. New fixed building services will achieve the required efficiency and control standards.
EN4, EN6, JPS2	A fabric-first approach is taken for both new and refurbished areas to minimise energy demand through low U-values, low air permeability and the provision of natural light. The energy efficient, all-electric servicing strategy includes VRF and air source heat pump technology to avoid fossil fuel combustion and enable benefit from green energy suppliers. On-site renewable energy generation is not technically viable due to overshading from surrounding buildings. However, new roof space will provide a large outdoor wellbeing space and planting to provide natural screening, additional rainwater attenuation and an element of carbon sequestration. Predicted space heating demand, Energy Use Intensity and Carbon Dioxide emissions are reported.
EN8, JP S4	External shading in the form of architectural projections, solar control glass and zoned conditioning services will mitigate the risk of thermal discomfort throughout the year. External building finishes and soft landscape will prevent excessive absorption, contributing to the urban heat island effect. Internal water use will be minimised through water efficient sanitaryware and leak detection to reduce the impact upon supply. Although impermeable area will not be increased significantly, planting at ground and rooftop levels will provide additional rainwater attenuation.
EN16, JPS5	The fully mechanically ventilated strategy will ensure an adequate fresh air supply to all occupied areas within the extension, with external pollutants from road traffic etc. filtered. The all-electric servicing strategy avoids fossil fuel combustion and a negative impact upon the local environment. Active travel facilities will help provide green transport alternatives.

Table 4. Approach to policy

Introduction

This energy statement has been compiled at RIBA Stage 3 in support of the proposed Manchester One development.

The proposed building extension will realign Manchester One with future expectations and the evolving streetscape, support occupant wellbeing and champion Bruntwood's ambition to achieve net zero carbon across the estate.

Passive design principles have been applied to create attractive spaces, with excellent access to natural resources and to minimise energy demand. Building services will be highly efficient, maintain optimal internal conditions and support detailed post occupancy evaluation through an appropriate sub-metering strategy.

Dynamic thermal modelling has been used to assess indoor environmental factors, predicted energy demand and annual CO_2 emissions. Results are set out within the body and the appendix of this report. The extension and the tower window replacement have been addressed independently.



Figure 1. Architectural render images

Manchester One

Manchester One is a prominent building located in the heart of Manchester City Centre. Its narrow floor plate allows for excellent access to daylight and cross-ventilation. Constructed in the 1960s, the concrete-framed structure has only undergone modest and gradual modifications over the past six decades.

Internal wall insulation has been installed below window lines and between structural columns on 11 of the building's 20 upper office floors. While the original narrow-cavity double glazing has been replaced upon failure, it is inefficient compared with current standards.

Most areas have been disconnected from the original central LTHW heating system, resulting in the partial decommissioning of the two original gas-fired boilers. The remaining boiler operates at low capacity, serving what is understood to be a single tenant along with the central core areas. Room conditioning is now primarily provided by individual VRF units, with condensers located in a ground floor compound, on the roof, and in various store areas accessed from the central stair core.



Figure 2. Proposed extension

Proposals comprise of two key elements; firstly, the construction of a 4-storey (plus rooftop) extension featuring a contemporary entrance reception, a flexible commercial unit, staff welfare amenities, and premium office space; and secondly, the full window replacement, and provision of internal wall insulation to the existing tower.

Manchester One

In addition to improving the quality and function of the building, proposals are intended to achieve a significant step towards improving operational energy efficiency and net zero carbon status.

Fabric improvement to the existing tower building will reduce thermal loss, limit solar gain in summertime and improve system controllability. Continued transition from on-site gas combustion to electrification will prevent Scope 1 emissions and benefit from the ongoing decarbonisation of the national grid.

Works aim to align with current and emerging policy and achieve targeted EUI (Energy Use Intensity) and operational carbon emissions.

Planning Policy

National Policy

National Planning Policy Framework (2024)

The National Planning Policy Framework (NPPF) sets out the UK Government's planning policies for England and how they should be applied. Its overarching aim is to achieve sustainable development by balancing economic growth, social well-being, and environmental protection. The framework promotes the efficient use of land, the delivery of sufficient homes, and the creation of high-quality, safe, and inclusive communities. It encourages plan-led development, giving local authorities the responsibility to prepare up-to-date local plans that reflect national priorities while responding to local needs.

The NPPF also seeks to protect the natural and historic environment, support sustainable transport, and ensure that planning decisions contribute positively to the quality of life and resilience of communities.

Building Regulations Approved Document Part L2: 2021 edition incorporating 2023 amendments (England)

Part L (Conservation of Fuel and Power) of the Building Regulations 2010 sets energy performance requirements for buildings in England and Wales. The aim is to improve the energy efficiency of building fabric and services whenever significant work is carried out. When thermal elements e.g. walls, roofs, floors, or windows are replaced or renovated, they must be upgraded to meet prescribed U-value standards where technically and economically feasible. Extensions or conversions that increase a building's heated or cooled area, as well as the installation or upgrading of fixed building services such as HVAC or lighting, must comply with current efficiency requirements. For larger buildings (> 1000m²), certain works trigger the need for consequential improvements, requiring additional cost-effective measures to improve overall building performance—often representing around 10% of the project's value. These might include better insulation, improved lighting controls, or upgrades to heating systems.

Overall, Part L encourages incremental improvement of existing buildings' energy efficiency through proportionate upgrades to fabric and services, aligning with national carbon-reduction and energy-performance objectives.

Local Policy

Manchester City Core Strategy (2012) and its Addendum (2024)

Policy EN 4: Reducing CO_2 Emissions by Enabling Low and Zero Carbon Development

The Council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO_2 emissions, and rising fossil fuel prices, through the following actions:

- Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies.
- Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings.
- Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes.
- The use of building materials with low embodied carbon in new development and refurbishment schemes.

*** This Core Strategy policy has been part replaced by Places for Everyone Plan (2024) Policy: JP-S2.**

Local Policy

Manchester City Core Strategy (2012) and its Addendum (2024)

Policy EN 6: Target framework for CO_2 reductions from low or zero carbon energy supplies

Applications for residential development of 10 or more units and all other development over 1,000 sq m will be expected as a minimum to meet the target, unless this can be shown not to be viable. This should be demonstrated through an energy statement, submitted as part of the Design and Access Statement. Such a statement will be expected to set out the projected regulated energy demand and associated CO_2 emissions for all phases of the development.

The energy statement will be required to be submitted at the outset of any proposed development (outline application or before). Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO_2 mitigation, subject to the energy statement incorporating evidence such as modelling to demonstrate compliance.

Guidance on what the energy statement should contain and how to decide which target applies to a development proposal is given in Appendix A.

*** This Core Strategy policy has been part replaced by Places for Everyone Plan (2024) Policy: JP-S2.**

Local Policy

Manchester City Core Strategy (2012) and its Addendum (2024)

Policy EN 8: Adaptation to Climate Change

All new development will be expected to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list:

- Reduction in urban heat island effect through the use of Green Infrastructure such as green roofs, green walls, increased tree cover and waterways
- The need to control overheating of buildings through passive design

Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO_2 mitigation under Policy EN6, subject to sufficient evidence to quantify their contribution to compliance.

*** This Core Strategy policy has been part replaced by Places for Everyone Plan (2024) Policy: JP-S2, JP-S4, JP-G8.**

Local Policy

Manchester City Core Strategy (2012) and its Addendum (2024)

Policy EN 16: Air Quality

The Council will seek to improve the air quality within Manchester. Developers will be expected to take measures to minimise and mitigate the local impact of emissions from traffic generated by the development, as well as emissions created by the use of the development itself, including from Combined Heat and Power and biomass plant.

When assessing the appropriateness of locations for new development the Council will consider the impacts on air quality, alongside other plan objectives. This includes cumulative impacts, particularly in Air Quality Management Areas.

*** This Core Strategy policy has been part replaced by Places for Everyone Plan (2024) Policy: JP-S5.**

Local Policy

Places For Everyone Plan (2024)

Policy JP-S2: Carbon and Energy

The aim of delivering a carbon neutral Greater Manchester no later than 2038, with a dramatic reduction in greenhouse gas emissions, will be supported through a range of measures including:

1. Promoting the retrofitting of existing buildings with measures to improve energy efficiency and generate renewable and low carbon energy, heating and cooling.
2. Promoting the use of life cycle cost and carbon assessment tools to ensure the long-term impacts from development can be captured;
3. Taking a positive approach to renewable and low carbon energy schemes, particularly schemes that are led by, or meet the needs of local communities;
4. Increasing the range of nature-based solutions including carbon sequestration through the restoration of peat-based habitats, woodland management, tree-planting and natural flood management techniques;
5. An expectation that new development will, unless it can be demonstrated that it is not practicable or financially viable;

    a. Be net zero carbon(29) which applies:

        - from adoption – to regulated operational carbon emissions;
        - from 2028 – to all emissions 'in construction'.

    From 2025 development should also calculate and minimise carbon emissions from unregulated emissions alongside regulated emissions.

    Development proposals should set out how this has been achieved in an energy statement in accordance with the energy hierarchy, which in order of importance seeks to:

        i. Minimise energy demand;

        ii. Maximise energy efficiency;

i. Use renewable energy;

ii. Use low carbon energy; and

iii. Utilise other energy sources.

From 2025 any residual carbon emissions that cannot be fully mitigated on-site should be offset, in agreement with the relevant local planning authority through a financial contribution to a carbon offset fund.

As an interim measure, development should be consistent with the 2022 Part L Building Regulations unless superseded by changes to building regulations and/or national or local planning policies.

b. Incorporate adequate electric vehicle charging points, in line with Part S of the Building Regulations, unless superseded by relevant Local Plan policies, to future proof for the likely long-term demand, taking account of the potential maximum energy demand for the site;

c. Where practicable, prioritise connection to a renewable energy/heating/cooling network in the first instance or a low carbon energy/heating/cooling network that is adaptable to non-fossil fuels at a later date;

d. In residential developments, achieve energy demand reductions in terms of space heat demand; hot water energy demand and the delivery of on-site renewable energy generation, in accordance with Table 5.1.

For renewable energy generation priority should be given to PV installation where technically feasible, alternative technologies will be appropriate where the equivalent generation is evidenced.

e. For non-residential developments, achieve at least BREEAM excellent standard (or equivalent) for the 'Ene 01 – reduction of energy use and carbon emissions' category rising to 'BREEAM outstanding' equivalent for ENE 01 from 2028.

f. Include a detailed energy statement to demonstrate via site relevant evidence how the development has sought to maximize reductions in carbon emissions in line with

Local Policy

relevant policy targets, including the minimisation of overheating risks and appropriate measures for post occupancy evaluation. Whole life cycle emissions should be considered where possible.

Districts may set out specific carbon emission reduction and energy demand targets within Local Plans.

Local Policy

Places For Everyone Plan (2024)

Policy JP-S4: Flood Risk and the Water Environment

An integrated catchment-based approach will be taken to protect the quantity and quality of water bodies with reference to the North West River Basin Management Plan and managing flood risk, by:

1. Returning rivers to a more natural state, where practicable;
2. Working with natural processes and adopting a natural flood management approach to slow the speed of water drainage and intercept water pollutants;
3. Locating and designing development so as to minimise the impacts of current and future flood risk, including retrofitting or relocating existing developments, infrastructure and places to increase resilience to flooding;
4. Expecting developments to manage surface water run-off through sustainable drainage systems and as close to source as possible. Development should achieve greenfield run-off rates unless it is demonstrated to be impracticable. District local plans should consider setting more detailed surface water drainage policies to reflect local circumstances, including alternative surface water discharge rates, such as in areas with critical drainage issue.
5. Ensuring that sustainable drainage systems:
    i. Are designed to provide multifunctional benefits wherever possible, including for water quality, nature conservation and recreation;
    ii. Avoid adverse impacts on water quality and any possibility of discharging hazardous substances to ground;
    iii. Are delivered in a holistic and integrated manner, including on larger sites split into different phases; and
    iv. Are managed and maintained appropriately to ensure their proper functioning over the lifetime of the development.

Local Policy

Places For Everyone Plan (2024)

Policy JP-S4: Flood Risk and the Water Environment

6. Securing the remediation of contaminated land and the careful design of developments to minimise the potential for urban diffuse pollution to affect the water environment; and

7. As a minimum, residential development should meet the mandatory water efficiency standard of 125 litres/person/day as set out in Building Regulations. District local plans may and should consider setting a tighter water efficiency standard of 110 litres/person/day where there is a clear local need with reference to national guidance on housing optional technical standards.

Local Policy

Places For Everyone Plan (2024)

Policy JP-S5: Clean Air

A comprehensive range of measures will be taken to support improvements in air quality, focusing particularly on locations where people live, where children learn and play, where there are impacts on the green infrastructure network and where air quality targets are not being met, including:

1. Locating and designing development, and focusing transport investment, so as to reduce reliance on forms of transport that generate air pollution;
2. Determining planning applications having regard to the most recent development and planning control guidance published jointly by the Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK), and the most recent IAQM Guidance on the Assessment of Dust from Demolition and Construction, or relevant successor guidance, including the requirement for developers to submit construction management plans as appropriate;
3. Requiring applications for developments that could have an adverse impact on air quality to submit relevant air pollution data so that adverse impacts on air quality can be fully assessed and development only permitted where they are acceptable and/or suitable mitigation can be provided;
4. Restricting developments that would generate significant point source pollution such as some types of industrial activity and energy generation;
5. Significantly expanding the existing commercial network of electric vehicle charging points, both for public and private use, including as part of new developments;
6. Implementing the Clean Air Plan and associated measures;
7. Facilitating the more sustainable distribution of goods within the urban area, including through accommodating urban consolidation centres and urban distribution centres that use ultra-low-emission vehicles, and local delivery facilities to reduce repeat delivery attempts;

Local Policy

Places For Everyone Plan (2024)

Policy JP-S5: Clean Air

A comprehensive range of measures will be taken to support improvements in air quality, focusing particularly on locations where people live, where children learn and play, where there are impacts on the green infrastructure network and where air quality targets are not being met, including:

8. Designing streets to avoid trapping air pollution at ground level, including through the appropriate location and scale of buildings and trees;
9. Controlling traffic and parking within and around schools, early years sites and other locations that are particularly sensitive to air quality;
10. Promoting actions that help remove pollutants from the air, such as enhancing the green infrastructure network and using innovative building materials that capture air pollutants; and
11. Development should be located in areas that maximise the use of sustainable travel modes and be designed to minimise exposure to high levels of air pollution, particularly for vulnerable users.

Building Extension

Proposed Development

The 4-storey (plus rooftop) extension will feature a contemporary entrance reception, active travel facilities, open-plan office space, and indoor/outdoor fitness and recreational areas. A new flexible commercial unit along the Sackville Street frontage offering indoor seating and a continental-style streetside terrace.

Proposed development comprises both new-build and refurbished building areas. In accordance with Approved Document Part L, the extension is not considered a 'new building' on the basis that the new floor area is less than 25% of the original building floor area.

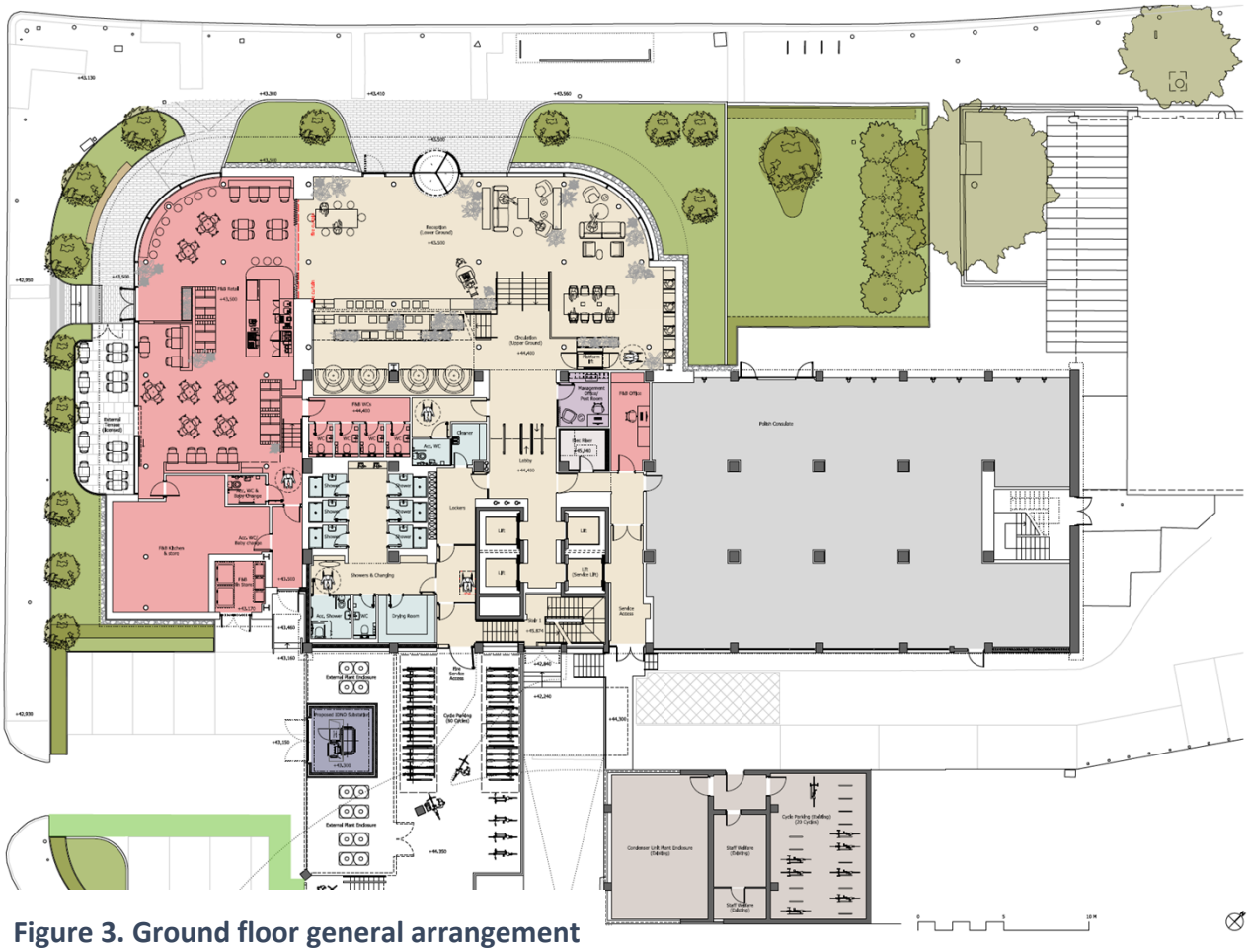


Figure 3. Ground floor general arrangement

The site presents various technical constraints including; building orientation; existing fabric and storey dimensions: building services routes; available plant space and; overshading from surrounding buildings. Despite challenges, an energy strategy has been developed in accordance with the established Burntwood's commitment towards achieving operational net zero carbon.

Energy Strategy



Form

The extension will partly occupy land between the original building, Portland Street and Sackville Street, a proportion of which is currently hardstanding. The building footprint will follow the radius of the road junction and retain a landscaped belt around its perimeter.

New upper floor levels will equal those within the existing building, restricting the opportunity for generous service voids. Building service riser locations will tag onto existing routes to promote clear, unobstructed space.

Occupied rooms will be in areas with excellent access to daylight, and views into the adjacent cityscape. Open breakout zones are situated centrally and toilets within the original core of the building.

The development has been modelling using IES-VE software. The following table relates to new-build areas.

NIA (m^2)	External Envelope Area (m^2)	Heat Loss Form Factor
2,150	3,030	1.41

Table 5. Building form

Glazed proportions

To compensate for a restricted storey height, new areas feature full-height glazing to maximise the provision of natural light and visual connection to outside.

External façade projections and solar control glass will balance natural light and the control of solar gain in summertime.

Energy Strategy



Fabric

Performance targets are based upon current Part L2 guidance for new and retained thermal elements, with betterment where viable. New internal space are predominantly office-use with relatively high internal heat gains from occupants, internal lighting and ICT equipment. Space heating does not typically represent the most significant energy use, and although unnecessary heat loss must be avoided, it must be balanced with heat retention in summertime to mitigate the risk of overheating and the excessive use of air conditioning.

Element	U-value ($W/m^2.K$)	Notes
Ground floor	0.18	-
Exposed floor	0.18	-
External wall (new)	0.26	-
External wall (refurbished)	0.30	Internal wall insulation
Roof	0.18	Flat roof forming outdoor amenity space
Curtain wall	1.30	Inclusive of frame and opaque infill
Window (replacement)	1.20	Windows within original façade

Table 6. Building fabric performance

Air Permeability

Uncontrolled air infiltration will be mitigated through continuity at interface details and the use of relatively impermeable materials. An overall air permeability of 5 $m^3/h.m^2$ @ 50Pa is targeted for new areas.

Energy Strategy



Ventilation

New building areas will feature a sealed façade and balanced, mechanical ventilation. Central Air Handling Units (AHUs) will ensure adequate fresh air is suppled to occupied areas, they will vary air volume according to demand and recover most of the useful heat from exhaust air streams.

Space Heating Demand

Annual demand for heat is minimised in design through efficient fabric, variable-volume mechanical ventilation and exhaust air heat recovery.

Initial dynamic simulation modelling has been undertaken using IESVE ApacheHVAC software to quantify predicted room conditioning loads. Space heating demand is calculated over a simulated year and considers; full occupancy, regional weather data, building envelope performance, internal design conditions, and occupancy heat gains.

Building Part	Space Heating Load (kWh)	GIA (m^2)	Space Heating Demand Intensity (kWh/m^2.yr)
New	37,440	2,812	13.3
New + Refurbished	49,910	3.025	16.5

Table 7. Space heating demand

Energy Strategy



Efficient Building Services

Further to reducing demand, the following measures will be taken to ensure the efficient use of energy.

1. Room CO_2 level sensors to enable mechanical ventilation to be controlled upon indoor air quality and prevent over supply.
2. Exhaust air heat recovery to harness waste heat to temper fresh air during the heating season.
3. High-efficacy LED lighting designed to provide excellent uniformity and avoid over-illumination. Presence detection and photocell sensors will switch or dim luminaires to their control use where and when it is required.
4. VRF (Variable Refrigerant Flow) providing heating and cooling to c.85% of the new building areas. High seasonal efficiencies are attainable through the redistribution of thermal energy within the building.
5. A zonal heating and cooling strategy to promote thermal comfort and prevent the over use of systems.

Energy Strategy



Connected Heat

The UK Government heat network zone map indicates significant opportunity within Greater Manchester owing to the density of development.



Figure 4. Heat network opportunity zone

Through passive design measures the space heating load will be relatively low and limited to more extreme weather periods. Therefore, the connection to or, development of a new district heating network is considered technically inappropriate and economically unviable.

Energy Strategy



Electrification and Low Carbon Heat

Transitioning away from fossil fuel combustion requires significant upgrades to the electrical infrastructure. The new 4-storey (plus rooftop) extension, replacement of gas-fired heating in the will increase the peak electricity demand.

Presently, the building is served by a dated ENWL 800kVA unit located within the basement plant room. Through initial design calculations it is proposed that the substation capacity be increased to 1500kVA, requiring additional space to locate the new equipment.

A dedicated substation building will be constructed above the existing plantroom deck, on the external perimeter of the new condenser compound. Located at the rear of the building, the area is not visually prominent though will be architecturally screened partly forming a passageway to the new cycle storage and welfare facilities.

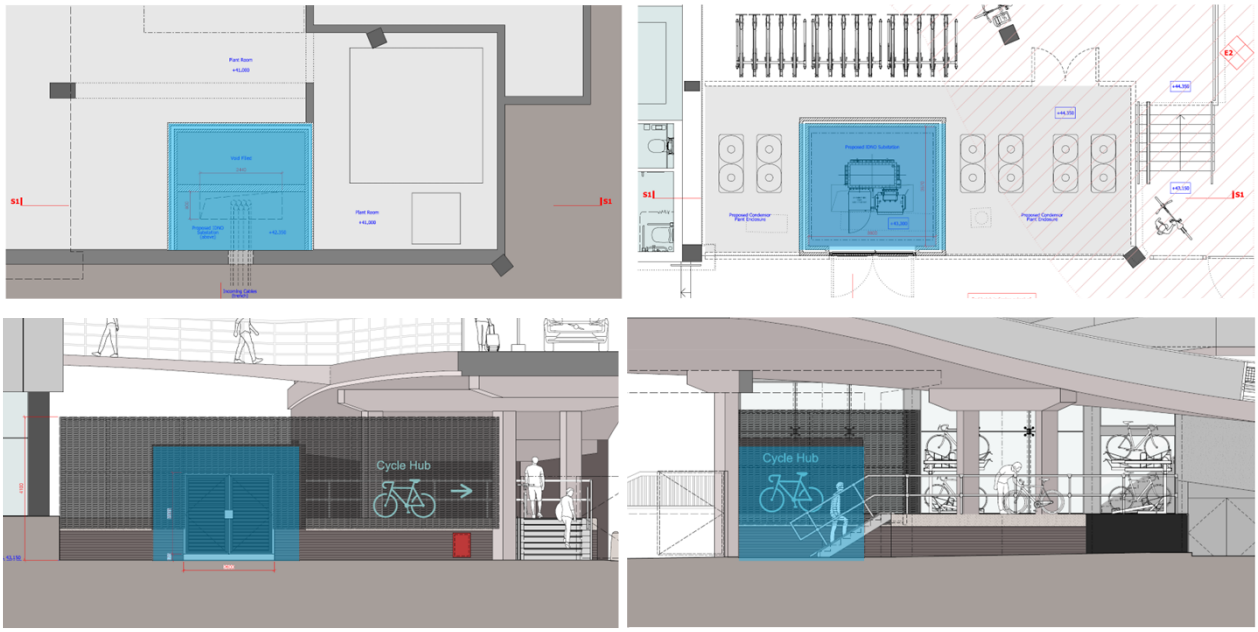


Figure 5. Proposed substation containment above plant room

Energy Strategy



Renewable Energy

Established technologies have been considered in development of the renewable energy strategy.

Heat Pumps

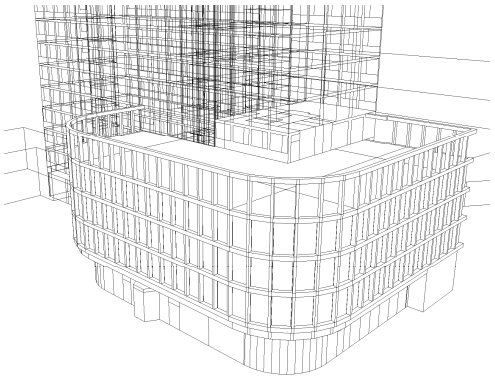
Centralised air to water heat pumps will generate domestic hot water for the development. This strategy will avoid fossil-fuel combustion, achieve a high efficiency and provide a scalable solution which can be extended to serve the tower for onward decarbonisation.

Solar Collection (Thermal/PhotoVoltaic)

The opportunity for solar collection is limited due to an unavailability of exposed building area and structural challenges affixing panels to upper areas of the southwest facing elevation. With this considered, these technologies are currently unviable for integration to this development.

Predictive Energy Modelling

Dynamic simulation modelling has been undertaken using IES-VE software by a CIBSE accredited assessor.



Dynamic modelling has been undertaken for the proposed extension to predict the annual energy consumption and attributable CO_{2e} emissions for both regulated and unregulated uses.

Approved Document Part L2

As a building extension, it is expected that the new-building energy and CO_2 requirements of Approved Document Part L are not applicable. A similar assessment approach is undertaken to derive the preliminary Energy Performance Certificate (EPC).

BREEAM Ene01 Excellent

Although BREEAM is not required for this scheme, planning policy does denote that where viable, a BREEAM Ene01 score of Excellent should be achieved. Due to site constraints and the incorporation of existing building elements within the scheme, attainment of this standard is considered unviable. However, the fundamental objectives of this BREEAM credit issue have been followed through reducing the demand for energy, employing efficiency measures and minimising CO_2 emissions.

Energy Use Intensity (EUI)

Predicted regulated and unregulated energy has been calculated for both a benchmark scheme utilising the existing available heating services and for the proposed, low-carbon strategy.

Predictive Energy Modelling

Component	Parameter	Input
Weather	Simulation file	2016 Manchester TRY
Fabric	U-values	Refer to Table 2
Internal lighting	Luminaire efficacy	> 100 lm/c.W. Office power density ≤5W/m^2
	Control	Presence detection and daylight dimming
External lighting	Load	Excluded from assessment.
Heating & cooling	Internal conditions	From Part L NCM profile: 22°C – 23°C (office-type spaces)
	Office VRF SCoP/SEER	3.51 / 6.06 (electric panel heaters to core)
Ventilation	Mechanical supply	12l/s.person
	SFP	1.83 – 1.89 W/l/s
	Heat recovery	75 – 78%
	Control	Speed control linked to indoor CO_2 levels
Domestic hot water	Demand	From Part L NCM profiles: c.5m^3/weekday
	Generator and efficiency	Air to water heatpumps, SCoP > 2.87
	Storage	1000litres, standing losses 0.0047 kWh/l.day
	Secondary circulation	200m, loss 6.0 W/m, pump 0.2 kW.
Occupancy	No. people	From Part L NCM profile: Maximum occupancy c.410 people Weekdays ≈ 8am – 6pm
Equipment	Office ICT	15 W/m^2

Table 9. Model input data

Predictive Energy Modelling - Summary

Mechanical building services have been represented using IES-VE ApacheHVAC. An initial simulation has been undertaken to establish baseline performance utilising the current heating infrastructure, assuming 4-pipe fancoils and a dedicated air-cooled chiller. Domestic hot water is provided by the current in-line heaters. The proposed scheme has been simulated for full occupancy and maximum ICT loads, and also for 75% diversity with office and meeting areas and more energy efficient ICT equipment (at 8 W/m^2).

CO_{2e} emissions have been derived using the *UK Government GHG Conversion Factors for Company Reporting* (2025):

Grid-supplied electricity: 0.17700 kg.CO_2e/kWh

Natural gas (GCV): 0.18259 kg.CO_2e/kWh

The conditioned GIA is taken from the model to be 3,025 m^2.

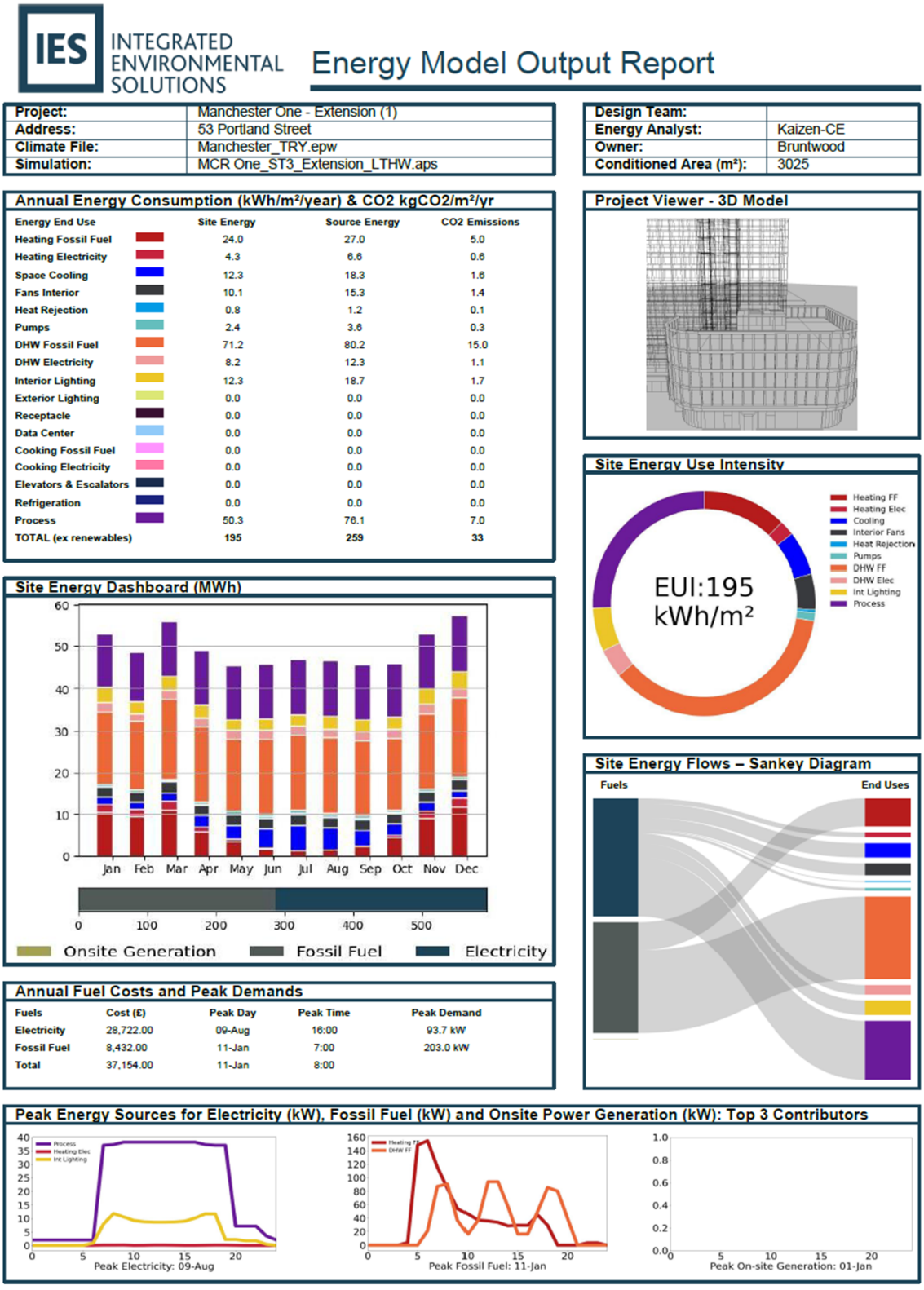
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Baseline	287.9	152.2	152.4	195*	26.9	79.5
Proposed	0	152.2	159.0	102	26.9	28.1
Diversified	0	86.1	145.0	76	15.2	25.7

Table 10. Predicted operational energy consumption and CO_2 emissions (Extension)

* Incudes fossil fuel combustion.

Results highlight the reduction in both energy and CO_2 emissions achieved through the efficiency and low-carbon servicing strategy. Small power (office equipment) accounts for almost 50% of the predicted energy consumption, highlighting the need to consider in achieving Net Zero Carbon. Where a level of operational diversity is included, the predicted EUI is below the Office 2026 target of 83 kWh/m^{2}GIA.yr.

Energy Use Intensity



IES INTEGRATED ENVIRONMENTAL SOLUTIONS

Energy Model Output Report

Project:	Manchester One - Extension (1)
Address:	53 Portland Street
Climate File:	Manchester_TRY.epw
Simulation:	MCR One_ST3_Extension_LTHW.aps

Design Team:	
Energy Analyst:	Kaizen-CE
Owner:	Bruntwood
Conditioned Area (m²):	3025

Annual Energy Consumption (kWh/m²/year) & CO2 kgCO2/m²/yr

Energy End Use	Site Energy	Source Energy	CO2 Emissions
Heating Fossil Fuel	24.0	27.0	5.0
Heating Electricity	4.3	6.6	0.6
Space Cooling	12.3	18.3	1.6
Fans Interior	10.1	15.3	1.4
Heat Rejection	0.8	1.2	0.1
Pumps	2.4	3.6	0.3
DHW Fossil Fuel	71.2	80.2	15.0
DHW Electricity	8.2	12.3	1.1
Interior Lighting	12.3	18.7	1.7
Exterior Lighting	0.0	0.0	0.0
Receptacle	0.0	0.0	0.0
Data Center	0.0	0.0	0.0
Cooking Fossil Fuel	0.0	0.0	0.0
Cooking Electricity	0.0	0.0	0.0
Elevators & Escalators	0.0	0.0	0.0
Refrigeration	0.0	0.0	0.0
Process	50.3	76.1	7.0
TOTAL (ex renewables)	195	259	33

Project Viewer - 3D Model

Site Energy Use Intensity

EUI:195 kWh/m²

Heating FF, Heating Elec, Cooling, Interior Fans, Heat Rejection, Pumps, DHW FF, DHW Elec, Int Lighting, Process

Site Energy Dashboard (MWh)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Onsite Generation, Fossil Fuel, Electricity

Site Energy Flows – Sankey Diagram

Fuels, End Uses

Annual Fuel Costs and Peak Demands

Fuels	Cost (£)	Peak Day	Peak Time	Peak Demand
Electricity	28,722.00	09-Aug	16:00	93.7 kW
Fossil Fuel	8,432.00	11-Jan	7:00	203.0 kW
Total	37,154.00	11-Jan	8:00	

Peak Energy Sources for Electricity (kW), Fossil Fuel (kW) and Onsite Power Generation (kW): Top 3 Contributors

Peak Electricity: 09-Aug

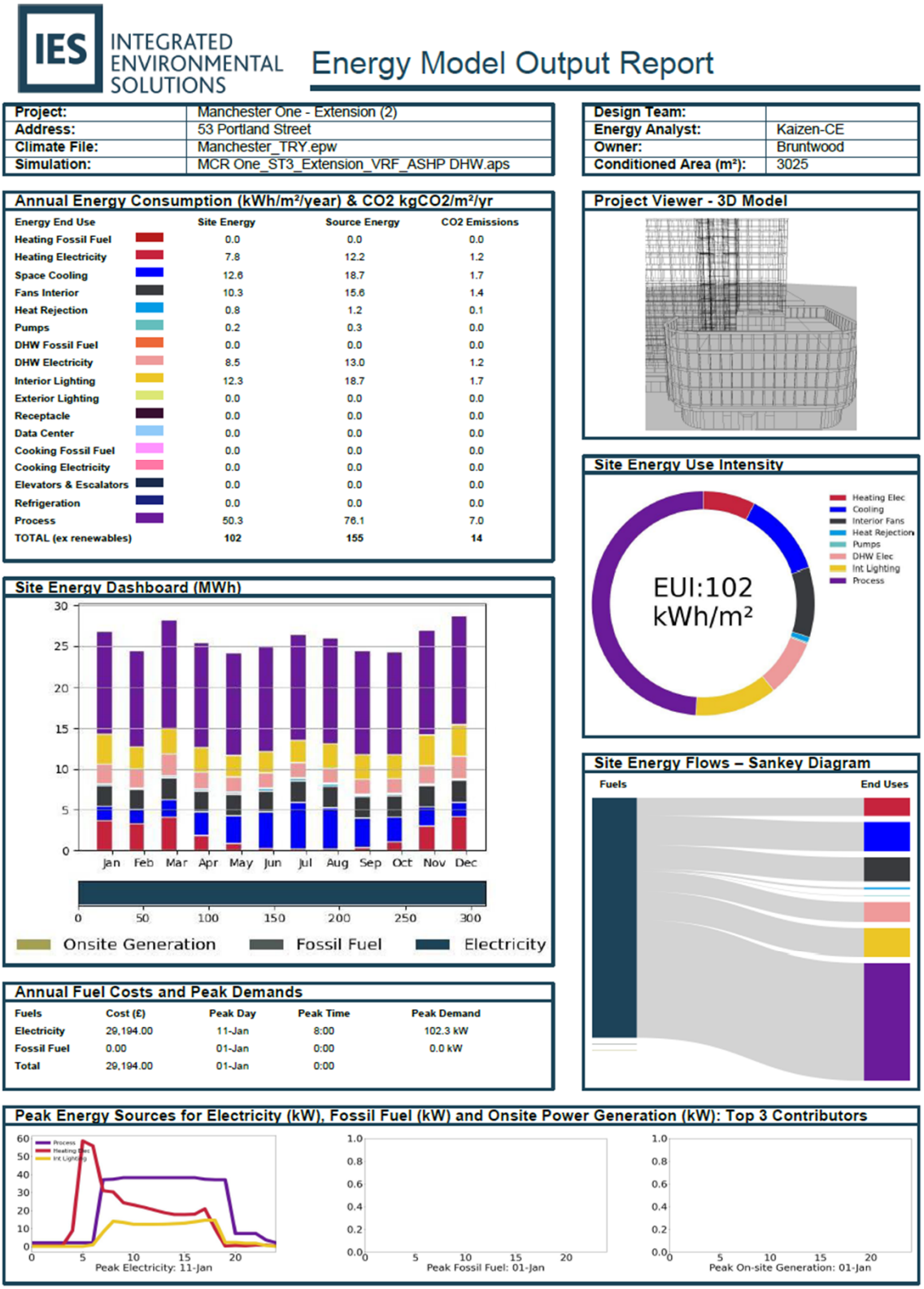
Peak Fossil Fuel: 11-Jan

Peak On-site Generation: 01-Jan

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Figure 6. Energy by end use – Extension 'Baseline'

Energy Use Intensity



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Energy Model Output Report

Project:	Manchester One - Extension (2)
Address:	53 Portland Street
Climate File:	Manchester_TRY.epw
Simulation:	MCR One_ST3_Extension_VRF_ASHP DHW.aps

Design Team:	
Energy Analyst:	Kaizen-CE
Owner:	Bruntwood
Conditioned Area (m²):	3025

Annual Energy Consumption (kWh/m²/year) & CO2 kgCO2/m²/yr

Energy End Use	Site Energy	Source Energy	CO2 Emissions
Heating Fossil Fuel	0.0	0.0	0.0
Heating Electricity	7.8	12.2	1.2
Space Cooling	12.6	18.7	1.7
Fans Interior	10.3	15.6	1.4
Heat Rejection	0.8	1.2	0.1
Pumps	0.2	0.3	0.0
DHW Fossil Fuel	0.0	0.0	0.0
DHW Electricity	8.5	13.0	1.2
Interior Lighting	12.3	18.7	1.7
Exterior Lighting	0.0	0.0	0.0
Receptacle	0.0	0.0	0.0
Data Center	0.0	0.0	0.0
Cooking Fossil Fuel	0.0	0.0	0.0
Cooking Electricity	0.0	0.0	0.0
Elevators & Escalators	0.0	0.0	0.0
Refrigeration	0.0	0.0	0.0
Process	50.3	76.1	7.0
TOTAL (ex renewables)	102	155	14

Project Viewer - 3D Model

Site Energy Use Intensity

EUI:102 kWh/m²

Heating Elec, Cooling, Interior Fans, Heat Rejection, Pumps, DHW Elec, Int Lighting, Process

Site Energy Dashboard (MWh)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Onsite Generation, Fossil Fuel, Electricity

Site Energy Flows – Sankey Diagram

Fuels, End Uses

Annual Fuel Costs and Peak Demands

Fuels	Cost (£)	Peak Day	Peak Time	Peak Demand
Electricity	29,194.00	11-Jan	8:00	102.3 kW
Fossil Fuel	0.00	01-Jan	0:00	0.0 kW
Total	29,194.00	01-Jan	0:00	

Peak Energy Sources for Electricity (kW), Fossil Fuel (kW) and Onsite Power Generation (kW): Top 3 Contributors

Peak Electricity: 11-Jan

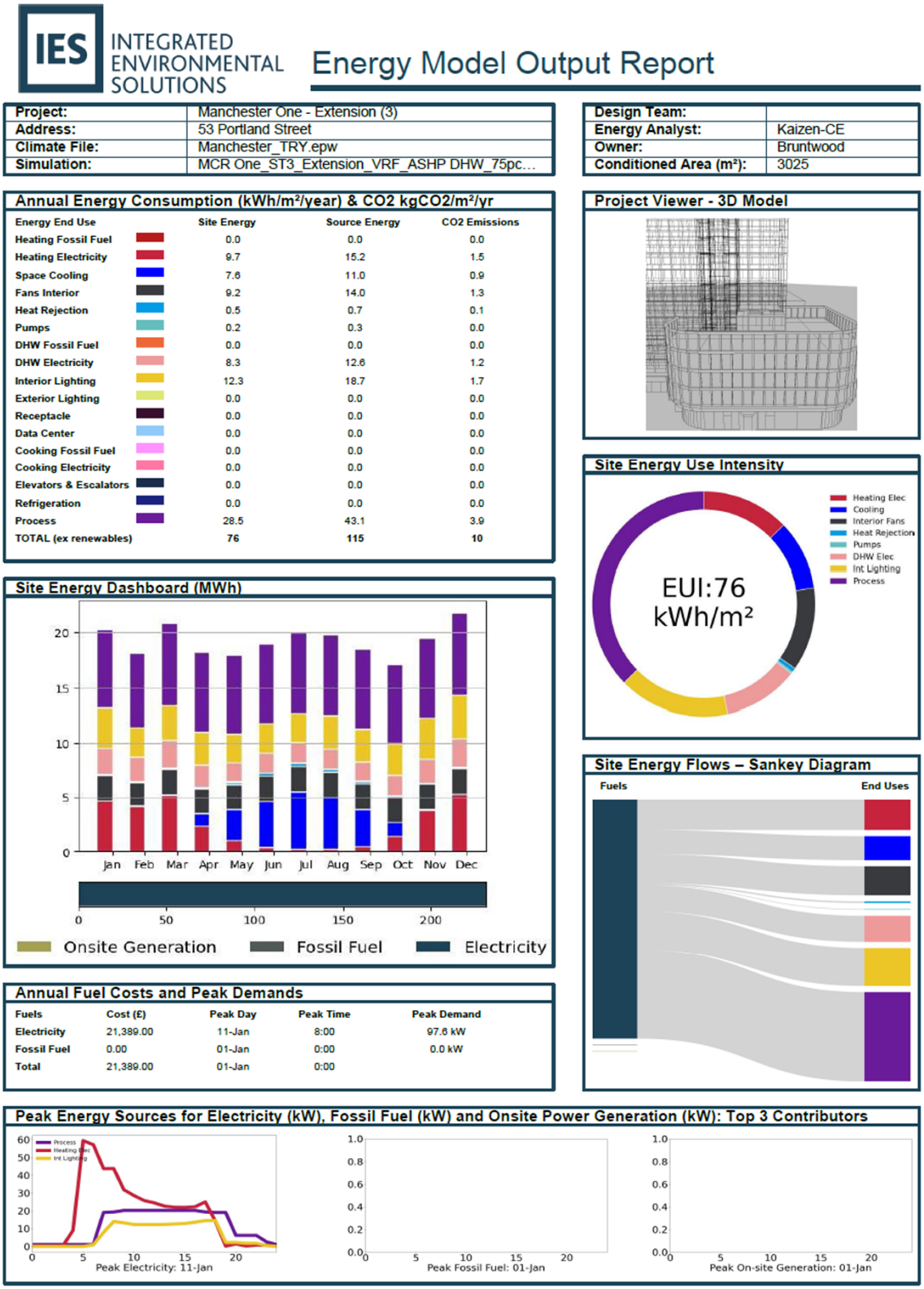
Peak Fossil Fuel: 01-Jan

Peak On-site Generation: 01-Jan

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Figure 7. Energy by end use – Extension 'Proposed'

Energy Use Intensity



IES INTEGRATED ENVIRONMENTAL SOLUTIONS

Energy Model Output Report

Project:	Manchester One - Extension (3)
Address:	53 Portland Street
Climate File:	Manchester_TRY.epw
Simulation:	MCR One_ST3_Extension_VRF_ASHP DHW_75pc...

Design Team:	
Energy Analyst:	Kaizen-CE
Owner:	Bruntwood
Conditioned Area (m²):	3025

Annual Energy Consumption (kWh/m²/year) & CO2 kgCO2/m²/yr

Energy End Use	Site Energy	Source Energy	CO2 Emissions
Heating Fossil Fuel	0.0	0.0	0.0
Heating Electricity	9.7	15.2	1.5
Space Cooling	7.6	11.0	0.9
Fans Interior	9.2	14.0	1.3
Heat Rejection	0.5	0.7	0.1
Pumps	0.2	0.3	0.0
DHW Fossil Fuel	0.0	0.0	0.0
DHW Electricity	8.3	12.6	1.2
Interior Lighting	12.3	18.7	1.7
Exterior Lighting	0.0	0.0	0.0
Receptacle	0.0	0.0	0.0
Data Center	0.0	0.0	0.0
Cooking Fossil Fuel	0.0	0.0	0.0
Cooking Electricity	0.0	0.0	0.0
Elevators & Escalators	0.0	0.0	0.0
Refrigeration	0.0	0.0	0.0
Process	28.5	43.1	3.9
TOTAL (ex renewables)	76	115	10

Project Viewer - 3D Model

Site Energy Use Intensity

Site Energy Dashboard (MWh)

Site Energy Flows – Sankey Diagram

Annual Fuel Costs and Peak Demands

Fuels	Cost (£)	Peak Day	Peak Time	Peak Demand
Electricity	21,389.00	11-Jan	8:00	97.6 kW
Fossil Fuel	0.00	01-Jan	0:00	0.0 kW
Total	21,389.00	01-Jan	0:00	

Peak Energy Sources for Electricity (kW), Fossil Fuel (kW) and Onsite Power Generation (kW): Top 3 Contributors

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Figure 8. Energy by end use – Extension 'Diversified'

Preliminary EPC

It is understood that the proposed extension is not required to demonstrate compliance with the new-building emissions targets set by Approved Document Part L2: 2021. Alternatively, minimum performance standards are stipulated for the building fabric and fixed building services.

The scale of the development is expected to trigger the requirement for consequential improvements, however, this is addressed through the proposed tower window replacement.

A preliminary EPC assessment has been undertaken for the extension in isolation, using current information outlined within this report. Please note that future changes to the design, specification and software methodology may impact subsequent ratings.

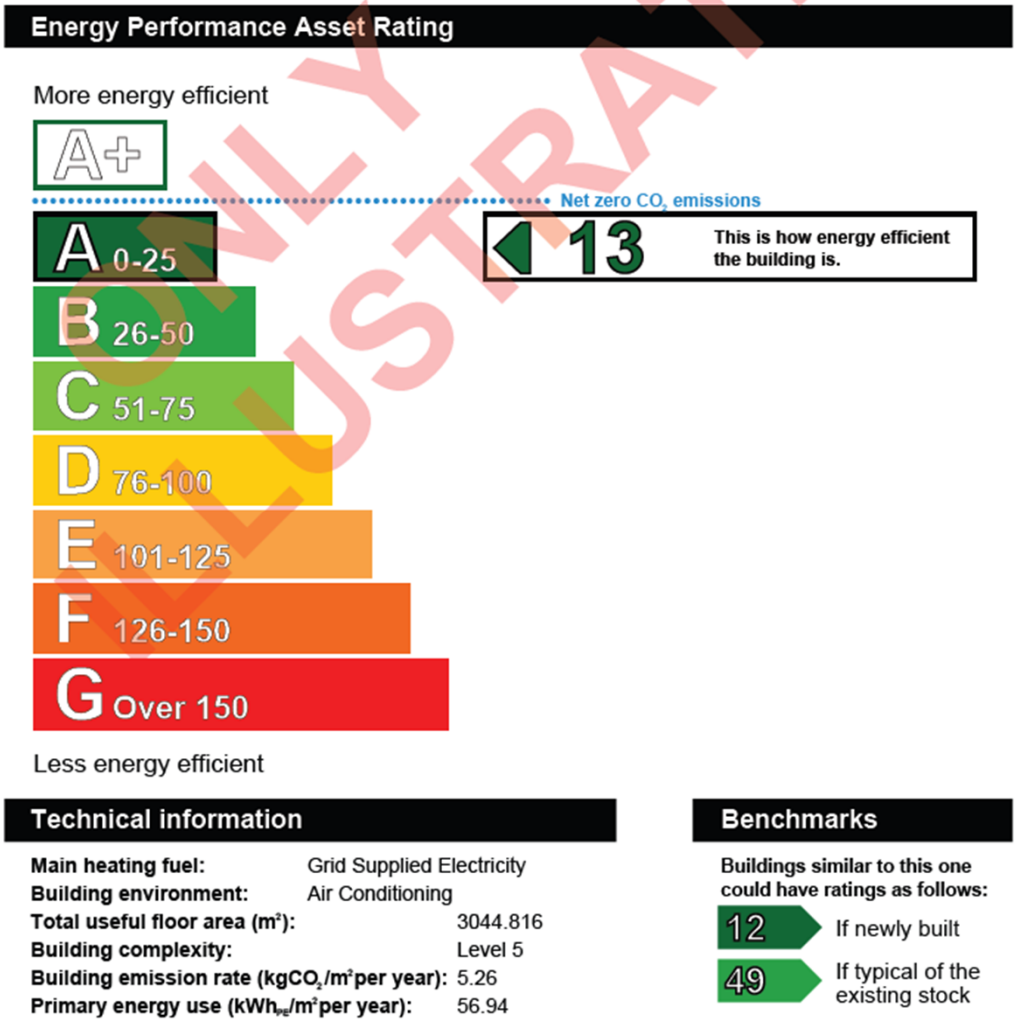


Figure 9. Preliminary EPC rating for the extension

ONLY FOR ILLUSTRATION

Summary

The first part of this report sets out the approach to energy in accordance with the energy hierarchy. An efficient, low-carbon strategy is shown to avoid fossil fuel use, reduce operational emissions and provide a base for ongoing decarbonisation of the site. Response to the identified policy objectives is tabulated below.

Policy	Approach
ADL2: 2021	New and retained thermal elements will achieve the U-value standards set out within the approved document. New fixed building services will achieve the required efficiency and control standards.
EN4, EN6, JPS2	A fabric-first approach is taken for both new and refurbished areas to minimise energy demand through low U-values, low air permeability and the provision of natural light. The energy efficient, all-electric servicing strategy includes VRF and air source heat pump technology to avoid fossil fuel combustion and enable benefit from green energy suppliers. On-site renewable energy generation is not technically viable due to overshading from surrounding buildings. However, new roof space will provide a large outdoor wellbeing space and planting to provide natural screening, additional rainwater attenuation and an element of carbon sequestration. Predicted space heating demand, Energy Use Intensity and Carbon Dioxide emissions are reported.
EN8, JP S4	External shading, solar control glass and zoned conditioning services will mitigate the risk of thermal discomfort throughout the year. External building finishes and soft landscape will prevent excessive absorption, contributing to the urban heat island effect. Internal water use will be minimised through water efficient sanitaryware and leak detection to reduce the impact upon supply. Although impermeable area will not be increased significantly, planting at ground and rooftop levels will provide additional rainwater attenuation.
EN16, JPS5	The fully mechanically ventilated strategy will ensure an adequate fresh air supply to all occupied areas, with external pollutants from road traffic etc. filtered. The all-electric servicing strategy avoids fossil fuel combustion and a negative impact upon the local environment. Active travel facilities will help provide green transport alternatives.

Table 11. Approach to policy

Tower Window Replacement and Fabric Improvement

Window Replacement and Fabric Improvement

The building envelope is largely original, designed when there was lesser emphasis upon thermal performance. Thermal U-values, uncontrolled infiltration and summertime solar gain are all relatively high compared with current standards.

Proposed window replacement addresses the first stage of the energy hierarchy (policy JP-S2 – 5.a.i); reducing energy demand.

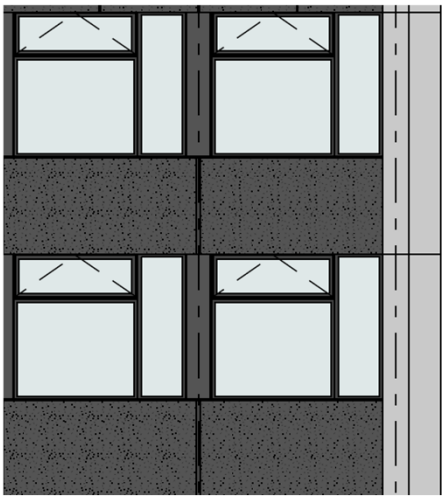


Figure 10. Existing window

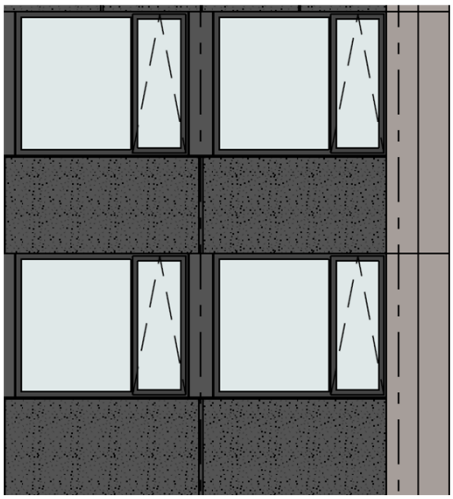


Figure 11. Proposed window

The tall, top-hung opening pane will offer greater accessibility than the existing high-level pane and includes a 100mm restrictor for safety.

Performance	Existing	Proposed
Thermal U-value ($W/m^2.K$)	4.00	1.18
Solar g-value (centre pane)	0.70	0.38
Visible light transmittance	0.85	0.74
Effective open area (m^2)	0.239 (200mm throw)	0.112 (100mm throw)

Table 12. Existing (estimated) and proposed window performance

Solar Gain in Summertime

Excessive solar gain can lead to occupant discomfort and a greater reliance on mechanical cooling during the summer months. Approved Document Part L introduces a compliance metric for new buildings, which compares total solar gain from April to September against a benchmark based on a notional façade specification. Meeting this benchmark demonstrates that the building provides an adequate level of solar control.

The floor plate has been divided about the centreline to form northwest and southeast zones for both the large (1) and small (2) office suites.

	Part L: 2021 Criterion 3: Limiting Solar Gain (% of recommended limit)							
	Original Windows				Proposed Windows			
Level/s	1.NW	1.SE	2.NW	2.SE	1.NW	1.SE	2.NW	2.SE
01	117	166	-	-	56	80	-	-
02	128	177	-	-	61	85	-	-
03	135	186	-	-	65	90	-	-
04	193	154	-	-	75	93	-	-
05	155	195	107	136	74	93	50	63
06 - 20	154	194	103	132	75	94	52	65

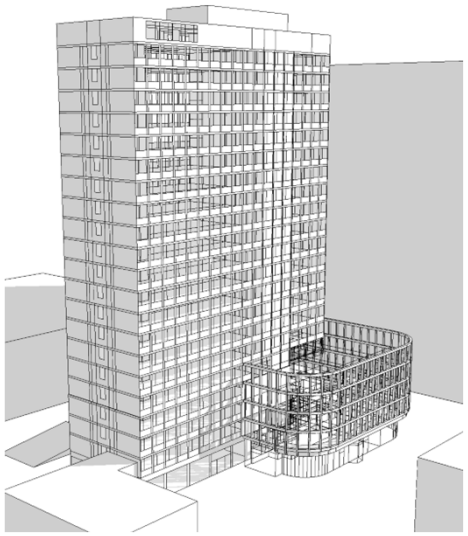
Table 13. Approved Document Part L Criterion 3 results (limiting solar gain)

Results show a notable reduction in solar control indicating lesser risk of overheating. It is however expected that comfort cooling will be required during summer months.

Energy Impact Assessment

Dynamic simulation modelling has been used to predict the impact of the proposed window replacement upon transmitted solar gain, indoor air quality (CO_2 concentration), and operational carbon emissions. Annual simulation is carried out against the CISBE weather data for Manchester.

Key model input parameters are summarised below.



Component	Parameter	Input
Facade U-value	External wall	1.83 W/m^2.K (uninsulated)
		0.38 W/m^2.K (proposed upgrade)
		0.39 W/m^2.K (previously upgraded)
	Perimeter RC column	1.88 W/m^2.K (uninsulated)
		0.39 W/m^2.K (previously upgraded)
Infiltration	Anticipated air permeability	10-15 m^3/h.m^2 @50Pa (0.35 ach^{-1})
Occupancy	Density (offices)	8 m^2/p
	Profile	9am – 5pm weekdays, with partial occupancy an hour ether side.
Internal gains	Lighting	Offices: approx. 6 W/m^2 Other: nominal LED efficacy
	Small power	Offices: approx. 15 W/m^2 Other: Part L NCM template data
Natural ventilation	Manually operated	To 100mm during occupied hours if CO_2 > 600-800 ppm

Table 14. Model input data – fabric and loads

Energy Impact Assessment

Mechanical and electrical plant has been represented within the dynamic model using the ApacheHVAC software module. Plant performance has been taken from manufacturers literature where available.

Component	Parameter	Input
Weather	Simulation file	2016 Manchester TRY
Heating & cooling	Internal conditions	From Part L NCM profile: 22°C – 23°C (office-type spaces)
	VRF SCoP/SEER	Manufacturers datasheets
	Condenser compound	Fan power 2.6 kW (occupied hours)
	Boiler efficiency	Generation = 65%, distribution = 50%.
Ventilation	Supply	Natural via opening windows
Domestic hot water	Demand	From Part L NCM profiles, approx. 0.2 l/per.h
	Generator	5no. Inline Rinnai HD70i gas-fired heaters
	Boiler efficiency	Generation = 83%, distribution = 50%
Miscellaneous	Advertising signage	Excluded
	External lighting	2.5 kW, dusk ‘til dawn sensor
	Lifts	3.5 kW, linked to occupancy profile
	Water booster set	3.75 kW, linked to occupancy profile

Table 15. Model input data – plant performance and miscellaneous loads

Indoor Air Quality (CO_2)

Annual simulation has been undertaken for six, open-plan office floors representing differing levels of window exposure. Bulk airflow is calculated using IES MacroFlo which considers wind pressure and temperature differentials across the window openings.

The following results show the average and maximum indoor CO_2 concentration levels during occupied hours for the summer period (July to September), when wind speeds and the indoor/outdoor temperature differential are at the lowest.

Level	Suite	Indoor CO_2 Concentration (ppm)	
		Annual Maximum	Summer Average
5	1	1019	715
	2	1035	716
9	1	1019	713
	2	1035	715
13	1	1018	711
	2	1034	713
17	1	1016	708
	2	1031	710
20	1	1027	713
	2	1042	716
21	1	767	648
	2	705	626

Table 16. Predicted indoor CO_2 concentration levels

Results show the predicted indoor CO_2 concentration levels to be within the CIBSE recommended limit for offices of 1000 ppm maintained and 1500 ppm maximum.

Predicted Operational Energy

The dynamic model has been simulated to calculate the predicted operational energy for the tower before and after the proposed window replacement. Additional simulations have been undertaken to assess the impact of VRF plant replacement and transition away from fossil fuel using electric point-of-use water heaters, with and without a level of operational diversity.

CO_{2e} emissions have been derived using the *UK Government GHG Conversion Factors for Company Reporting* (2025):

Grid-supplied electricity: 0.17700 kg.CO_2e/kWh

Natural gas (GCV): 0.18259 kg.CO_2e/kWh

The conditioned GIA is taken from the model to be 13,558 m^2.

Iteration	Gas (MWh/yr)	Elec (MWh/yr)		,EUI (kWh/m^2.yr)	CO_{2e} (tonnes./yr)	
	Reg.	Unreg.	Reg.		Unreg.	Reg
Baseline	441.4	653.4	1,157.0	166*	115.6	285.4
Proposed	375.1	653.4	1,124.1	159*	115.6	267.5
Future	0	653.4	1,028.1	124	115.6	182.0
Diversified	0	285.8	1,005.4	95	50.6	178.0

Table 17. Predicted operational energy consumption and CO_2 emissions (Tower)

- Incudes fossil fuel combustion.

Results show the positive impact that the proposed works have upon predicted energy consumption and CO_{2e} emissions. In addition to savings achieved via electrification and replacement VRF systems, further improvements are possible through operational and ICT changes.

Energy Use Intensity

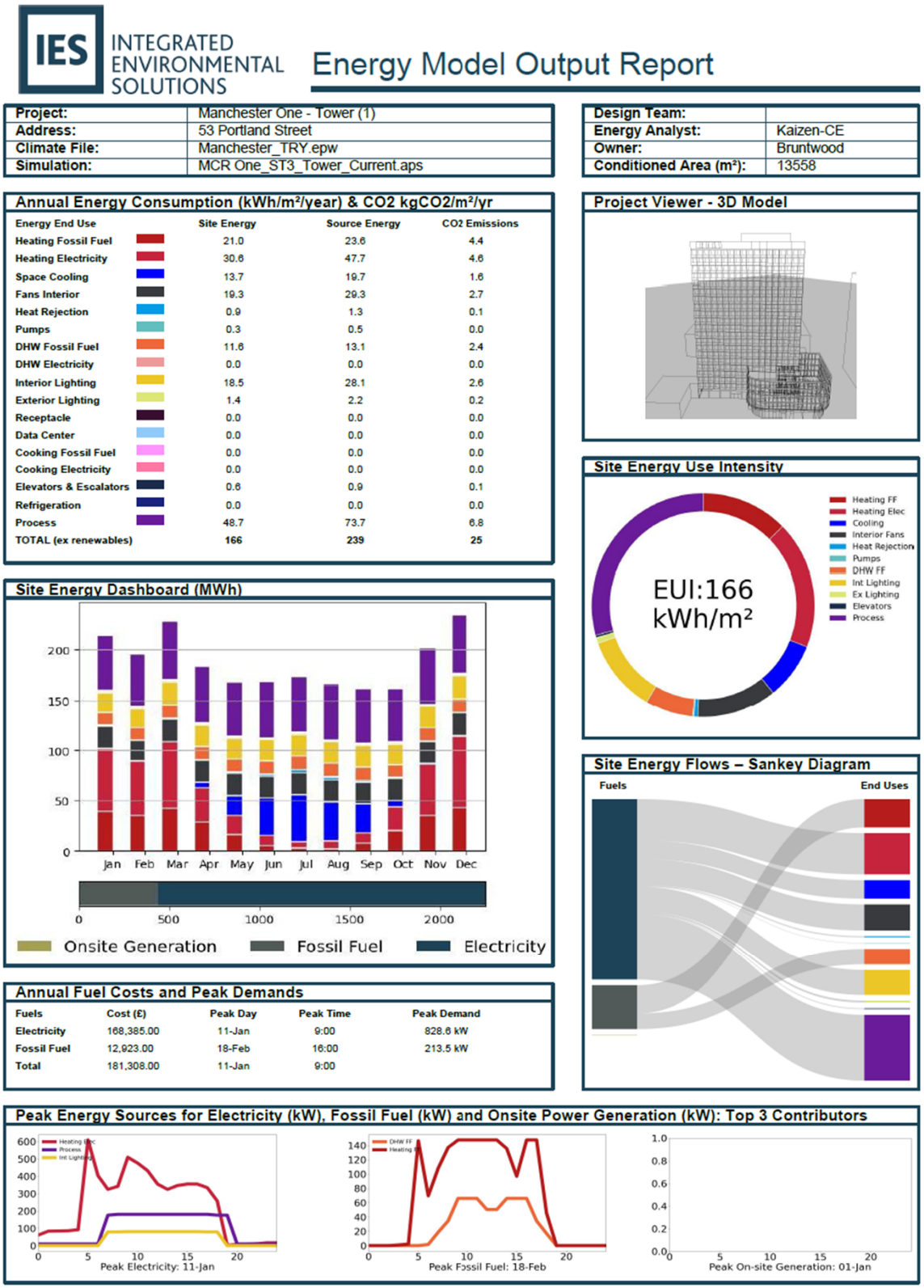
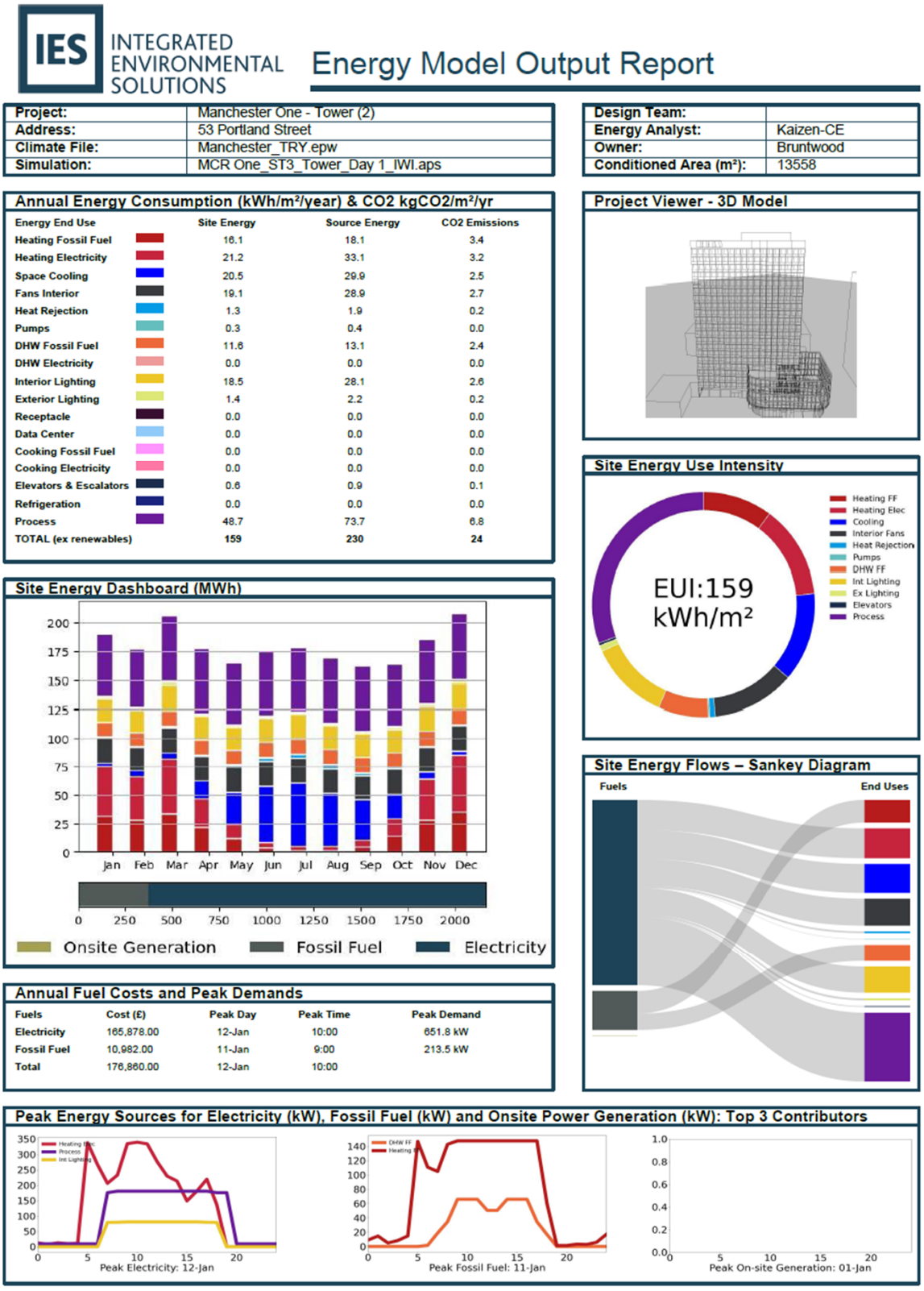


Figure 12. Energy by end use – Tower 'Current'

Energy Use Intensity



IES INTEGRATED ENVIRONMENTAL SOLUTIONS

Energy Model Output Report

Project:	Manchester One - Tower (2)
Address:	53 Portland Street
Climate File:	Manchester_TRY.epw
Simulation:	MCR One_ST3_Tower_Day 1_IWI.aps

Design Team:	
Energy Analyst:	Kaizen-CE
Owner:	Bruntwood
Conditioned Area (m²):	13558

Annual Energy Consumption (kWh/m²/year) & CO2 kgCO2/m²/yr

Energy End Use	Site Energy	Source Energy	CO2 Emissions
Heating Fossil Fuel	16.1	18.1	3.4
Heating Electricity	21.2	33.1	3.2
Space Cooling	20.5	29.9	2.5
Fans Interior	19.1	28.9	2.7
Heat Rejection	1.3	1.9	0.2
Pumps	0.3	0.4	0.0
DHW Fossil Fuel	11.6	13.1	2.4
DHW Electricity	0.0	0.0	0.0
Interior Lighting	18.5	28.1	2.6
Exterior Lighting	1.4	2.2	0.2
Receptacle	0.0	0.0	0.0
Data Center	0.0	0.0	0.0
Cooking Fossil Fuel	0.0	0.0	0.0
Cooking Electricity	0.0	0.0	0.0
Elevators & Escalators	0.6	0.9	0.1
Refrigeration	0.0	0.0	0.0
Process	48.7	73.7	6.8
TOTAL (ex renewables)	159	230	24

Project Viewer - 3D Model

Site Energy Use Intensity

EUI:159 kWh/m²

Heating FF, Heating Elec, Cooling, Interior Fans, Heat Rejection, Pumps, DHW FF, Int Lighting, Ex Lighting, Elevators, Process

Site Energy Dashboard (MWh)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Onsite Generation, Fossil Fuel, Electricity

Site Energy Flows – Sankey Diagram

Fuels, End Uses

Annual Fuel Costs and Peak Demands

Fuels	Cost (£)	Peak Day	Peak Time	Peak Demand
Electricity	165,878.00	12-Jan	10:00	651.8 kW
Fossil Fuel	10,982.00	11-Jan	9:00	213.5 kW
Total	176,860.00	12-Jan	10:00	

Peak Energy Sources for Electricity (kW), Fossil Fuel (kW) and Onsite Power Generation (kW): Top 3 Contributors

Peak Electricity: 12-Jan

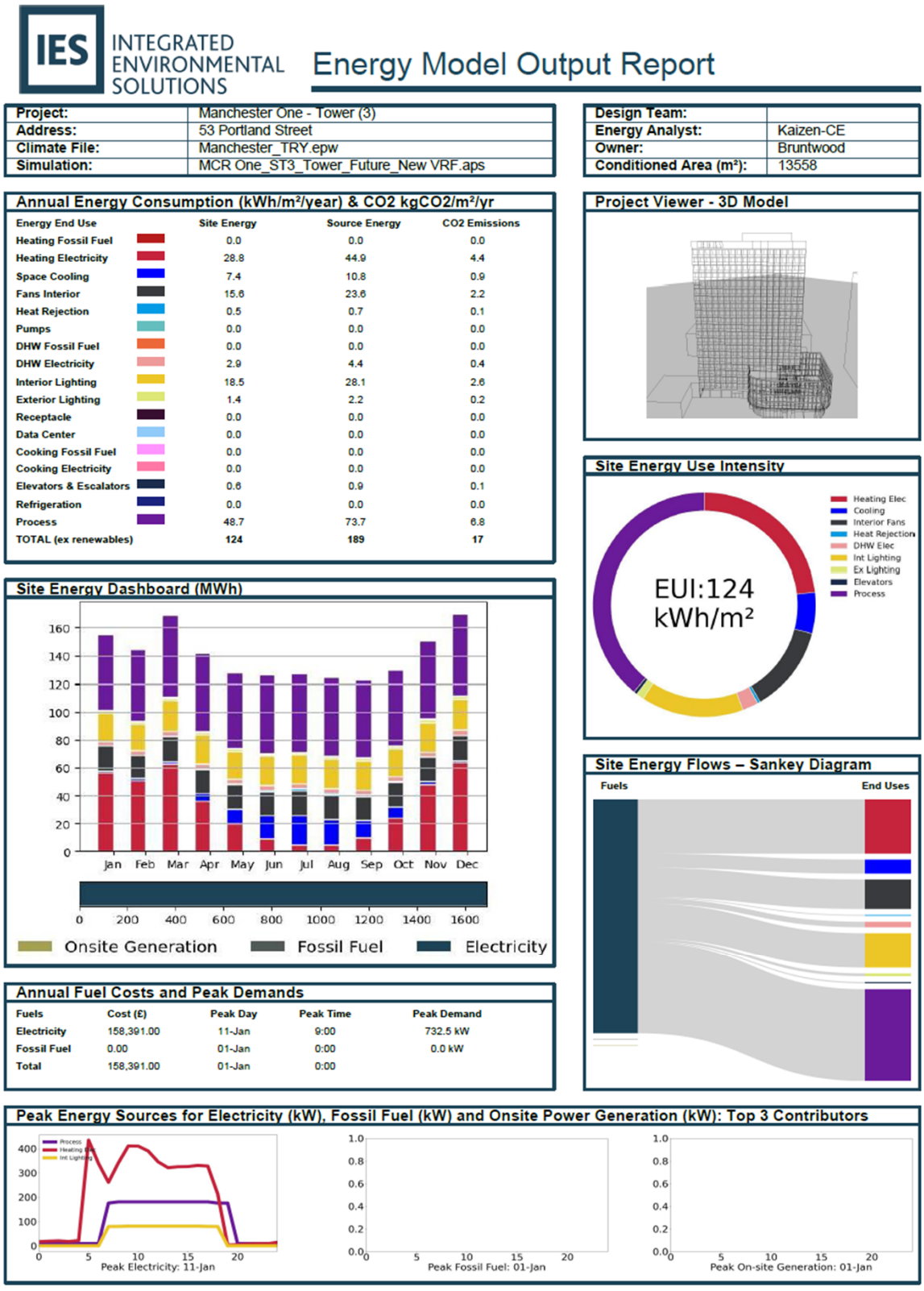
Peak Fossil Fuel: 11-Jan

Peak On-site Generation: 01-Jan

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Figure 13. Energy by end use – Tower 'Proposed'

Energy Use Intensity



IES INTEGRATED ENVIRONMENTAL SOLUTIONS

Energy Model Output Report

Project:	Manchester One - Tower (3)
Address:	53 Portland Street
Climate File:	Manchester_TRY.epw
Simulation:	MCR One_ST3_Tower_Future_New VRF.aps

Design Team:	
Energy Analyst:	Kaizen-CE
Owner:	Bruntwood
Conditioned Area (m²):	13558

Annual Energy Consumption (kWh/m²/year) & CO2 kgCO2/m²/yr

Energy End Use	Site Energy	Source Energy	CO2 Emissions
Heating Fossil Fuel	0.0	0.0	0.0
Heating Electricity	28.8	44.9	4.4
Space Cooling	7.4	10.8	0.9
Fans Interior	15.6	23.6	2.2
Heat Rejection	0.5	0.7	0.1
Pumps	0.0	0.0	0.0
DHW Fossil Fuel	0.0	0.0	0.0
DHW Electricity	2.9	4.4	0.4
Interior Lighting	18.5	28.1	2.6
Exterior Lighting	1.4	2.2	0.2
Receptacle	0.0	0.0	0.0
Data Center	0.0	0.0	0.0
Cooking Fossil Fuel	0.0	0.0	0.0
Cooking Electricity	0.0	0.0	0.0
Elevators & Escalators	0.6	0.9	0.1
Refrigeration	0.0	0.0	0.0
Process	48.7	73.7	6.8
TOTAL (ex renewables)	124	189	17

Project Viewer - 3D Model

Site Energy Use Intensity

EUI:124 kWh/m²

Heating Elec, Cooling, Interior Fans, Heat Rejection, DHW Elec, Int Lighting, Ex Lighting, Elevators, Process

Site Energy Dashboard (MWh)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Onsite Generation, Fossil Fuel, Electricity

Site Energy Flows – Sankey Diagram

Fuels, End Uses

Annual Fuel Costs and Peak Demands

Fuels	Cost (£)	Peak Day	Peak Time	Peak Demand
Electricity	158,391.00	11-Jan	9:00	732.5 kW
Fossil Fuel	0.00	01-Jan	0:00	0.0 kW
Total	158,391.00	01-Jan	0:00	

Peak Energy Sources for Electricity (kW), Fossil Fuel (kW) and Onsite Power Generation (kW): Top 3 Contributors

Peak Electricity: 11-Jan

Peak Fossil Fuel: 01-Jan

Peak On-site Generation: 01-Jan

Integrated Environmental Solutions 2025.1.0.0

Figure 14. Energy by end use – Tower 'Future'

Energy Use Intensity

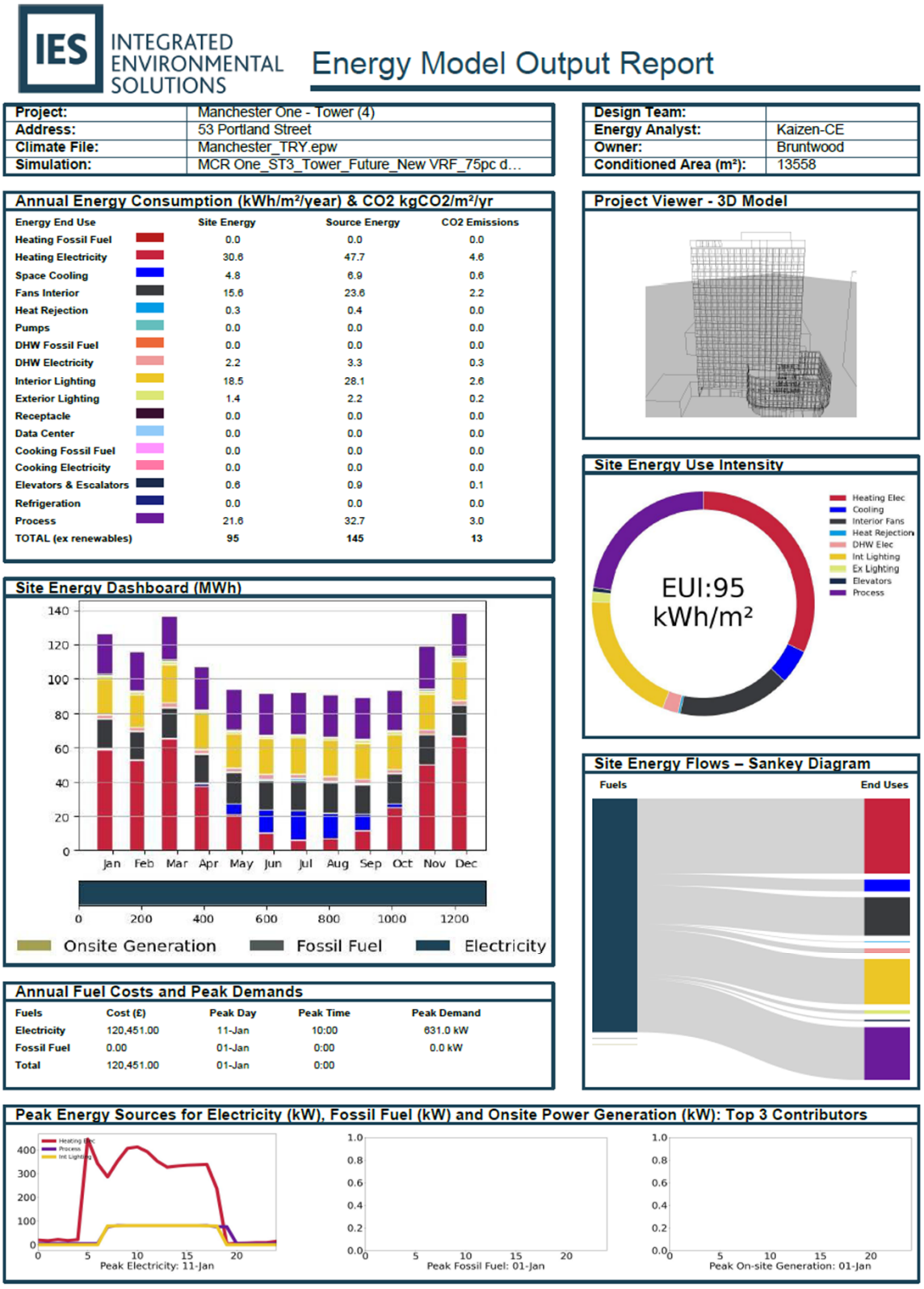


Figure 15. Energy by end use – Tower 'Future – Diversified'

Preliminary EPC

A preliminary EPC assessment has been undertaken for the tower in isolation, to account for the window replacement, internal wall insulation and anticipated improvement in air permeability. Please note that future changes to the design, specification and software methodology may impact subsequent ratings.

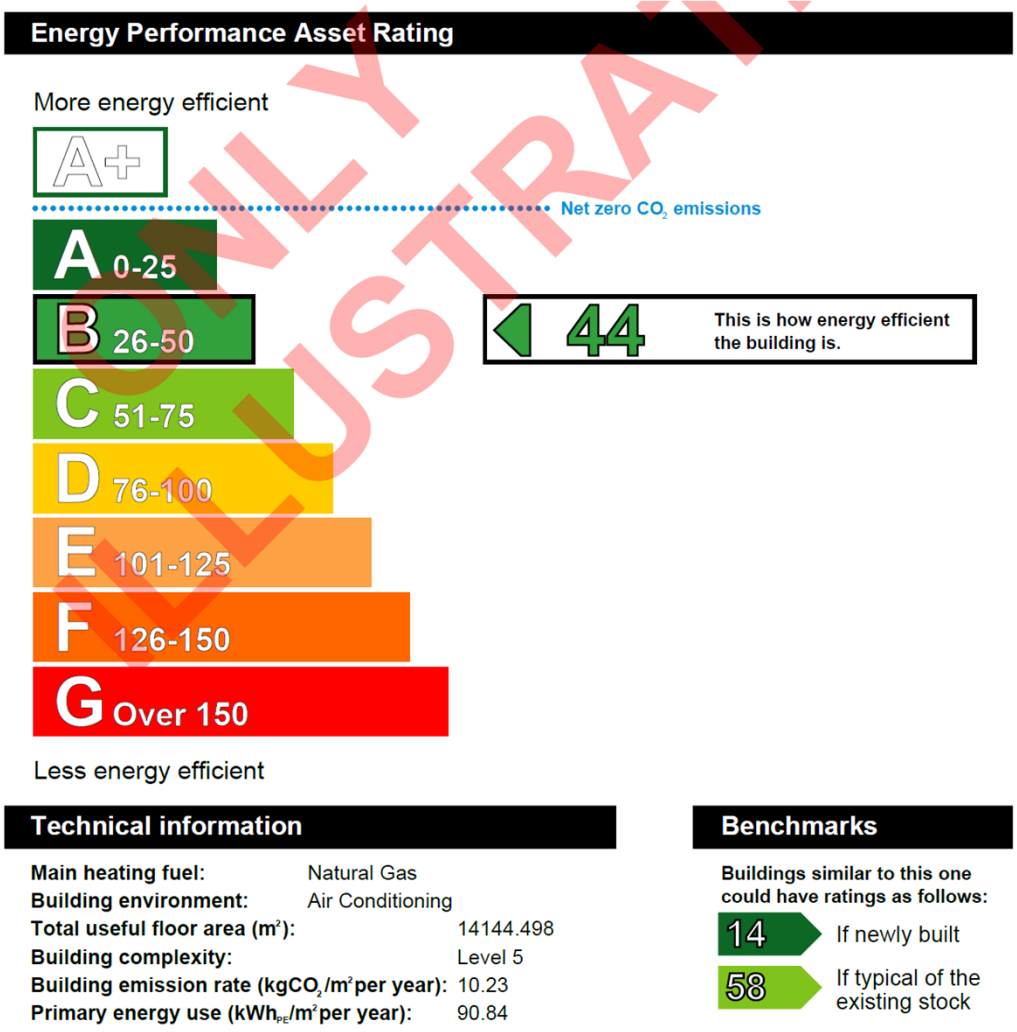


Figure 16. Preliminary EPC rating for the tower

Indicative results show an improvement beyond the current result of 66C, lodged on 28th September 2025.

Summary

Prior to the consideration of renewable energy technology and system efficiency improvements, the proposed façade upgrade intends address the first stage of the hierarchy in reducing the overall demand for energy.

Results show that through the retention of cross-ventilation and specification of solar control glass the new window arrangement can help mitigate the risk of summertime overheating, maintain good indoor air quality and reduce operational energy consumption. Window openings will be restricted to mitigate the risk of drops and falls, and top-hung to prevent confliction with internal blind operation.

Onward transition towards achieving net zero carbon will include further fabric improvements, increased service efficiencies and a move to full electrification.

KAIZEN

Consulting Engineers

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