



EPS Group
Energy Consultancy and Compliance Services

Project No: 24396

London Borough of Haringey Energy Statement

Extension and Reconfiguration of 1 Lakefield Road, London, N22 6RR to form 3No. Flats

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SAP Calculations – SBEM Calculations – Renewable Energy Statements – Energy Performance Certificates
Air Tightness Testing – Extract Fan Testing – Water Calculations – DEC Assessments – Room Integrity Testing



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Executive Summary

This report has been commissioned in response to the Sustainable and Low Carbon Planning Policy requirements of the London Borough of Haringey in respect to the proposed extension and reconfiguration of 1 Lakefield Road, Wood Green, London, N22 6RR to form 3No. self-contained flats.

In accordance with the Energy Hierarchy detailed within The London Plan 2021, this statement outlines an overall commitment to reducing energy consumption under occupancy through the adoption of enhanced insulation standards and improved heating and lighting efficiencies in comparison to the standard requirements of Approved Document L1 2021 of the Building Regulations.

Further improvements are then proposed through the installation of photovoltaic panels with a total minimum output capacity of **9.20 kWp**. It is initially proposed that this will comprise of 23 x 400 W panels being installed on the Southeast-facing pitched roof and the available flat roof of the development, equating to around **46.00 m²** worth of surface area. This will be proportioned to supplement the domestic electricity usage of flats as follows: 7 x 400 W panels to Flat 1; 8 x 400 W panels to Flat 2; and 8 x 400 W panels to Flat 3.

Predictive SAP calculations firmly demonstrate that the proposed development would be expected to deliver an overall minimum on site reduction in annual regulated carbon emissions of **37.99%** in comparison to the minimum requirements of Approved Document L1 2021 of the Building Regulations. This is thought to be the maximum amount of on-site savings that are technically feasible and economically viable for a small-scale development such as that proposed.

As the proposed development has not achieved zero carbon on-site, the shortfall in carbon dioxide emissions for the assumed lifetime of the development's services (30 years) will be met through a total cash-in-lieu contribution of **£6,680.40**.

In the circumstances, the proposed development is therefore deemed to comply with the mandatory requirements of Policy *SI 2: Minimising Carbon Dioxide Emissions* of The London Plan 2021 and the London Borough of Haringey's Strategic Policy *SP4: Working Towards a Low Carbon Haringey*.

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1.0 Introduction

- 1.1 EPS Group have been appointed to provide an Energy Statement to support the planning application for the proposed extension and reconfiguration of 1 Lakefield Road, Wood Green, London, N22 6RR to form 3No. self-contained flats.
- 1.2 It is anticipated that the development would fall under the requirements of Approved Document L1 (2021) of the Building Regulations, if planning is approved.
- 1.3 The energy consumption of the proposed dwellings has therefore been assessed using the National Calculations Method (NCM) - SAP 10 (Standard Assessment Procedure), in order to determine the predicted annual carbon dioxide (CO₂) emissions of the development and the associated reduction targets.
- 1.4 The following fuel emissions factors have been used within the underlying calculations as defined by the updated National Calculations Method (NCM):

Fuel	CO ₂ emission factor (kgCO ₂ /kWh)
Natural gas	0.210
Grid supplied electricity	0.136
Grid displaced electricity	0.136

- 1.5 This document should be used for planning purposes only and should be reassessed and where necessary, resubmitted at the Building Control stage if alternative building specifications or proposed HVAC systems are adopted as oppose to those outlined within the report.
- 1.6 It is also highlighted that the SAP calculations underlying this report rely on a number of standard operational parameters which may not ultimately match the actual measures adopted within the finalised dwellings. Whilst they provide a 'like for like' comparison for the purpose of this report they are not valid for Building Control purposes or for the actual operation of the development post completion.
- 1.7 The dimensions that are referenced within this report are based upon SAP measurement conventions which may result in slight differences with other dimensions quoted elsewhere.

2.0 Planning Policy Context

2.1 National

The National Planning Policy Framework (NPPF) outlines the Government's planning policies for England and how these are expected to be applied by local authorities. Section 14 of this document details how local policies should address climate change through the promotion of energy efficiency and the adoption of low carbon and renewable technologies. It states:

"14.0 Meeting the challenge of climate change, flooding and coastal change

161. *The planning system should support the transition to net zero by 2050 and take full account of all climate impacts including overheating, water scarcity, storm and flood risks and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.*

Planning for climate change

162. *Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating and drought from rising temperatures⁶¹. Policies should support appropriate measures to ensure the future health and resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.*

163. *The need to mitigate and adapt to climate change should also be considered in preparing and assessing planning applications, taking into account the full range of potential climate change impacts.*

164. *New development should be planned for in ways that:*

a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through incorporating green infrastructure and sustainable drainage systems; and

b) help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings in plans should reflect the Government's policy for national technical standards.

165. *To help increase the use and supply of renewable and low carbon energy and heat, plans should:*

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (including cumulative landscape and visual impacts);

- b) *consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and*
 - c) *identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.*
166. *In determining planning applications, local planning authorities should expect new development to: a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.*
167. *Local planning authorities should also give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic (including through installation of heat pumps and solar panels where these do not already benefit from permitted development rights). Where the proposals would affect conservation areas, listed buildings or other relevant designated heritage assets, local planning authorities should also apply the policies set out in chapter 16 of this Framework.*
168. *When determining planning applications for all forms of renewable and low carbon energy developments and their associated infrastructure, local planning authorities should:*
- a) *not require applicants to demonstrate the overall need for renewable or low carbon energy, and give significant weight to the benefits associated with renewable and low carbon energy generation and the proposal's contribution to a net zero future;*
 - b) *recognise that small-scale and community-led projects provide a valuable contribution to cutting greenhouse gas emissions;*
 - c) *in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site.*
169. *Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas."*

2.2 The London Plan

The London Plan is the overall strategic plan for London detailing a fully integrated economic, environmental, transport and social framework for the development of the city over the next 20 – 25 years.

Policy SI 2 of The London Plan March 2021 relates to 'Minimising Carbon Dioxide Emissions' and states:

"A Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

- 1) *be lean: use less energy and manage demand during operation*
 - 2) *be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly*
 - 3) *be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site*
 - 4) *be seen: monitor, verify and report on energy performance.*
- B Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.*
- C A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:*
- 1) *through a cash in lieu contribution to the borough's carbon offset fund, or*
 - 2) *off-site provided that an alternative proposal is identified and delivery is certain.*
- D Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.*
- E Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.*
- F Development proposals referable to the Mayor should calculate whole lifecycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions."*

2.3 The London Borough of Haringey

The relevant policy from the London Borough of Haringey's *Local Plan Strategic Policies 2013 – 2026 (formerly the Core Strategy)*, March 2013 is detailed below:

Strategic Policy 4: Working Towards a Low Carbon Haringey (SP4)

"Over the life time of the Local Plan, reducing energy use in buildings and working towards a low carbon borough will be one of the key challenges facing Haringey. The Council will promote the measures outlined below to reduce carbon emissions from new and existing buildings.

1. *In line with London Plan policy, the Council will promote and require all new developments to take measures to reduce energy use and carbon emissions during design, construction and occupation, by incorporating the following measures:*
 - a. *From 2011 onwards, all new residential development will achieve a minimum 25% reduction in total (regulated) CO₂ emissions in line with Code for Sustainable Homes Level 4 energy standards, and should aim to achieve Level*

6. All new residential development shall be zero carbon from 2016 onwards; and
 - b. From 2011 onwards all new non-residential development shall be built to at least BREEAM "very good" standard and should aim to achieve BREEAM "excellent" or the current nationally agreed standard. All new non-residential development shall be zero carbon from 2019.
2. The Council will promote low- and zero-carbon energy generation through the following measures:
 - a. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;
 - b. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;
 - c. Working with neighbouring boroughs and other partners to explore ways of implementing sub-regional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area; and
 - d. All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from onsite renewable energy regeneration, which can include connections to local sources of decentralised renewable energy."

2.4 Conclusions

On review of the above policies, it is evident that the development will need to achieve a zero-carbon standard as defined within *Policy SI 2* of The London Plan.

This will require a minimum 35% reduction in CO₂ emissions (using SAP 10 emission factors) to be achieved on site by following the Energy Hierarchy which promotes the use of Lean, Clean and Green measures, with 10% from energy efficiency measures. Any remaining carbon emissions may then be offset with a cash-in-lieu contribution to the local council which will be used to secure carbon dioxide savings elsewhere.

3.0 Energy Calculation Methodology

- 3.1 As detailed within Paragraph 1.3, SAP 10 has been utilised as an appropriate method for calculating the predicted energy consumption and the associated carbon dioxide emissions for the proposed development across a number of different scenarios.
- 3.2 Where specific information was unavailable due to the lack of detail ordinarily associated with Building Control specifications, details from previous comparable projects have been utilised. Alternatively, industry standard defaults and assumptions have been adopted and consistently applied across all variant calculations.
- 3.3 In the first instance a set of 'Notional' Baseline SAP Calculations were produced as outlined within Section 4.0 in order to determine the amount of annual regulated carbon dioxide (CO₂) emissions that would be permitted for the proposed development under the standard requirements of Approved Document L1 2021.
- 3.4 In response to the Energy Hierarchy of the London Plan 2021, a range of conventional energy efficiency improvements are proposed for the development which have then been modelled within SAP 10 to produce a set of 'Lean' Energy Calculations as detailed within Section 5.0.
- 3.5 In accordance with the 'Clean' step of the Energy Hierarchy, the feasibility of utilising decentralised energy networks or Combined Heat and Power (CHP) was then reviewed as detailed within Section 6.0.
- 3.6 The suitability of a wide range of renewable technologies has been reviewed for potential inclusion within the development, although it has been concluded that it would not be viable to install any of these technologies as detailed with Section 7.0.
- 3.7 Since it is not feasible or economically viable for the proposed dwellings to achieve zero carbon entirely through on-site measures, a cash in lieu payment for the cumulative shortfall was calculated at a rate of £95/tonne for a period of 30 years. This is in accordance with the London Plan 2021.

4.0 Notional Benchmark Energy Calculations

- 4.1 Notional SAP calculations (Baseline) have been produced for the development as a means of determining the maximum energy consumption and associated carbon dioxide (CO₂) emissions that would ordinarily be permitted under the standard requirements of Approved Document L1 2021 of the Building Regulations.
- 4.2 The Baseline SAP calculations are based upon the maximum permitted U-values allowable under Approved Document L1 2021, in conjunction with the minimum allowable lighting, heating and hot water system efficiencies as outlined within Table 1 below:

Table 1: Baseline SAP Specifications	
Fabric Insulation and Lighting Standards	
Element/Feature	Approved Document L1 2021 Minimal Acceptable Standard
Existing External Wall (thermally upgraded)	0.30 W/m ² K
Semi Exposed Wall to unheated communal stairs	0.28 W/m ² K (prior to sheltering factor)
New External Walls (incl. studs)	0.18 W/m ² K
Party Wall	0.00 W/m ² K
Existing Ground Floor (No thermal upgrade required)	0.36-0.21 W/m ² K
New Ground Floor	0.18 W/m ² K
Semi Exposed Floor to unheated communal stairs	0.25 W/m ² K (prior to sheltering factor)
Pitched Roof (New & thermally upgraded existing)	0.15 W/m ² K
New Flat Roof (incl. dormer)	0.15 W/m ² K
New Plane Ceiling	0.15 W/m ² K
New Double-Glazed Windows	1.60 W/m ² K
New Rooflights	2.20 W/m ² K
New Entrance Doors (Unglazed)	1.60 W/m ² K (prior to sheltering factor)
Lighting	All fixed lighting to have an efficacy of 75 lm/W
HVAC Details	
Heating & Hot Water	100% Efficient Direct Acting Electric Boilers with Programmer, Room Thermostats and TRVs
Heating Controls	210L cylinder with 2.30 kWh/day standing heat loss
Ventilation	Natural ventilation with intermittent extract fans

- 4.3 The key results of the Baseline SAP Calculations are summarised within Table 2 below with the full calculation worksheets available for detailed review within Appendix 1 of this report:

Table 2: Benchmark Annual Energy Consumption and CO ₂ Emissions (SAP 10)			
Dwelling	Floor Area (m ²)	Annual Regulated Energy Consumption (kWhr/year)	Annual Regulated CO ₂ Emissions (kg/year)
Flat 1	48.58	6,301.01	940.37
Flat 2	73.52	8,027.75	1,205.20
Flat 3	107.91	10,852.77	1,633.92
Totals		25,181.53	3,779.49

- 4.4 On review of the above, it is evident that the proposed development would be permitted to emit

- 4.5 In order to comply with the planning policies detailed in Section 2, a minimum on-site saving of **1,322.82 kgCO₂/year** will need to be achieved by adopting the principles of the Energy Hierarchy of the London Plan, with a minimum of **377.95 kgCO₂/year** from energy efficiency measures. Any remaining emissions may then be offset through a Section 106 payment to the council.

- 4.6 The CO₂ emissions arising from unregulated energy consumption within the development such as that used for cooking, appliances and powering equipment have also been estimated in accordance with the benchmarks produced by the Good Homes Alliance in 2020 and are summarised within Table 3 below:

Table 3: Non-Regulated Annual Energy Consumption and CO ₂ Emissions			
Dwelling	Floor Area (m ²)	Good Homes Alliance Benchmark Annual Energy Consumption from Cooking & Appliance Use (kWh/m ² /year)	Total Unregulated CO ₂ Emissions (kg/year)
Flat 1	48.58	24.40	1,185.35
Flat 2	73.52	21.90	1,610.09
Flat 3	107.91	19.30	2,082.66
Totals			4,878.10

- 4.7 As detailed above, the future occupants of the completed dwellings are predicted to consume energy from unregulated activities which will result in additional non-regulated carbon dioxide emissions of **4,878.10 kgCO₂/year**.
- 4.8 Whilst it is noted that targeting a reduction in non-regulated CO₂ emissions is outside of the guidance of the GLA, efforts will be made to reduce the impact of this type of energy consumption by only installing highly efficient energy rated appliances & equipment within the proposed dwellings.

5.0 Proposed Energy Strategy and Performance – Lean Measures

- 5.1 In accordance with the 'Lean' principles of the Energy Hierarchy, it is provisionally proposed to adopt the following minimum fabric, heating and lighting standards within the proposed development as a means of reducing its overall energy demand by conventional (lean) means:

Table 4: Proposed 'Lean' Fabric & Lighting Standards		
Element / Feature	Approved Document L1 2021 Minimal Acceptable Standard	Proposed Development Target
Existing External Wall (thermally upgraded)	0.30 W/m ² K	0.30 W/m²K
Semi Exposed Wall to unheated communal stairs	0.28 W/m ² K (before shelter factor)	0.18 W/m²K (before shelter factor)
New External Walls	0.18 W/m ² K	0.18 W/m²K
New Dormer and Stud Walls	0.18 W/m ² K	0.15 W/m²K
Party Wall	0.00 W/m ² K	0.00 W/m²K
Existing Ground Floor (No thermal upgrade required)	0.36-0.21 W/m ² K	0.36-0.21 W/m²K
New Ground Floors	0.18 W/m ² K	0.12 W/m²K
Semi Exposed Floor to unheated communal hall	0.25 W/m ² K (before shelter factor)	0.22 W/m²K (before shelter factor)
Pitched Roof (New & thermally upgraded existing)	0.15 W/m ² K	0.15 W/m²K
New Flat Roof (incl. dormer)	0.15 W/m ² K	0.15 W/m²K
New Plane Ceiling	0.15 W/m ² K	0.11 W/m²K
New Double-Glazed Windows	1.60 W/m ² K	1.20 W/m²K
New Rooflights	2.20 W/m ² K	1.20 W/m²K
New Entrance Doors (Unglazed)	1.60 W/m ² K (prior to shelter factor)	1.20 W/m²K (before shelter factor)
Lighting	Fixed lighting to have an efficacy of 75 lm/W	All fixed lighting to have an efficacy of 80 lm/W
Proposed 'Lean' HVAC Standards		
Heating	100% Efficient Direct Acting Electric Boilers with Programmer, Room Thermostats and TRVs	
Hot Water Storage	210L cylinder with 1.90 kWh/day standing heat loss	
Ventilation	Natural ventilation with intermittent extract fans	

- 5.2 The above build standards will ensure that the proposed dwellings have a reduced regulated energy demand in comparison to the minimum requirements of Approved Document L1 2021 of the Building Regulations. This will help to reduce the associated CO₂ emissions arising from occupancy.

- 5.3 It should also be noted that as a result of the rapid decarbonisation of the national grid, the carbon emissions factor for electricity was drastically lowered in the update to Part L of the Building Regulations that took effect from 15 June 2022. This means that electric heating systems are now deemed to be far less carbon intensive than mains gas systems.
- 5.4 The impact of the above 'Lean' measures on the proposed development's overall annual carbon dioxide emissions was determined by updating the Baseline SAP Calculations referenced in Section 4.0.
- 5.5 The results of the Lean SAP Calculations are summarised in Table 5 below with the full 'Lean' SAP Worksheets provided in Appendix 2 for detailed review:

Table 5: 'Lean' Annual Energy Consumption and CO ₂ Emissions (SAP 10)			
Dwelling	Floor Area (m ²)	Annual Regulated Energy Consumption (kWhr/year)	Annual Regulated CO ₂ Emissions (kg/year)
Flat 1	48.58	5,601.00	836.70
Flat 2	73.52	7,026.96	1,055.80
Flat 3	107.91	9,341.79	1,403.11
Totals		21,969.75	3,295.61

As a result of adopting the recommended 'Lean' energy efficient measures outlined within paragraph 5.1, the proposed development will have a reduced annual level of regulated CO₂ emissions of **3,295.61 kgCO₂/year**. This represents a total reduction of **12.80%** in comparison to the Baseline Carbon Dioxide Emissions detailed within Section 4.0.

6.0 Proposed Energy Strategy and Performance – Clean Measures

- 6.1 Where feasible, the Energy Hierarchy advocates the use of zero or low emission decentralised energy, prioritising connection to district heating and cooling networks and utilising secondary heat sources. In accordance with the ‘Clean’ step of the aforementioned Energy Hierarchy, developments should look to exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
- 6.2 On consulting the London Heat Map (see below), it is apparent that there is no existing or potential Energy Network within the immediate vicinity of the proposed development and as such any possible connection to an existing or planned network is unviable in this instance.



Figure 1: Results of the London Heat Map Search within Vicinity of the Development

- 6.3 Combined Heat and Power (CHP) units conventionally produce electricity at a localised level from mains gas. In generating electricity in this manner, the technology reduces the losses associated with the inefficient transportation of electricity across the national grid, whilst also producing large quantities of heat as a by-product. This heat can then be harvested and used for the provision of localised heating and hot water.
- 6.4 It should be noted that CHP units are not suitable for all developments as they require sustained heat load demands in order to achieve maximum operating efficiencies. Since there are no economic or sustainability benefits associated with oversizing a CHP installation, a large proportion of smaller developments are often unsuitable for this technology.
- 6.5 On review of the above circumstances, coupled with a growing concern on the detrimental impact that CHP equipment can have on urban air quality, the use of this technology within the development is deemed to be unviable.

7.0 Review of Low Carbon and Renewable Technologies

7.1 In response to the 'Green' requirement of the Energy Hierarchy a number of different renewable technologies were reviewed in terms of their overall suitability for inclusion within the proposed development.

7.2 Wind Turbine (Column or Roof Mounted)

Benefits	When installed in optimal positions, wind turbines can generate a large amount of renewable electricity, the surplus of which can be exported at financial gain to the national grid via the Smart Export Guarantee scheme.
Site Limitations / Restrictions	- Not aesthetically pleasing nor in keeping with the local area. - The site is too sheltered as a result of its urban location which would result in unreliable and insufficient outputs. - Requires ongoing maintenance vulnerable to future neglect. - Can produce unacceptable levels of noise to occupants and neighbours.
Conclusion	The technology is not deemed as being suitable for use within the proposed development.

7.3 Solar Photovoltaic

Benefits	- When installed in optimal positions, photovoltaic (PV) arrays generate large amounts of renewable electricity for local use and exporting at financial gain to the national grid via the Smart Export Guarantee scheme. - Minimal ongoing costs & maintenance issues following installation. - Easy to integrate into a conventional or retrofit applications. - The development benefits from Southeast-facing pitched roof space providing optimal locations for the installation of PV panels to maximise efficiency generation capacity.
Site Limitations / Restrictions	- PV panels are not aesthetically pleasing and may detract from the visual appearance of the development. - As a result of the rapid decarbonisation of the national grid, the amount of CO₂ savings with this technology is limited as the CO₂ emission factor for grid displaced electricity is relatively low.
Conclusion	It is proposed to utilise this technology within the proposed development.

7.4 Solar Thermal

Benefits	- Solar hot water systems can provide an efficient way of contributing to a dwelling's overall hot water requirements. - Minimal ongoing costs & maintenance issues following installation. - As with PV, the proposed development benefits from southeast-facing pitched roof space providing effective locations for the siting of Solar Thermal collectors.
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Site Limitations / Restrictions	- The amount of CO₂ savings with this technology is restricted as there is no benefit to producing more hot water than is used within a dwelling. - Solar collectors are not aesthetically pleasing and may detract from the visual appearance of the development.
Conclusion	It is not proposed to use this technology within the proposed development.

7.5 Ground Source Heat Pump (GSHP)

Benefits	- High operating efficiencies (CoPs). - Reliable and proven technology. - Generally low maintenance costs. - No visual impact on the property.
Site Limitations / Restrictions	- Detailed ground surveys required. - Minimal space to facilitate an installation. - High capital installation costs render GSHPs financially unviable.
Conclusion	The technology is not deemed as being suitable for use within the proposed development.

7.6 Air Source Heat Pump

Benefits	- High operating efficiencies (CoPs). - Reduced visual impact on the property. - Reliable and proven technology. - Generally low maintenance costs.
Site Limitations / Restrictions	- Could potentially require a supplementary immersion heating system for hot water production. - The external units can result in some noise related problems although this can be limited through the careful selection of particular models with low operating acoustic levels and the potential use of acoustic housing units.
Conclusion	It is not proposed to use this technology within the proposed development.

7.7 Biomass Boilers

Benefits	Reliable and proven technology.
Site Limitations / Restrictions	- Require large storage facilities for the fuel. - On-going cleaning, maintenance and management requirements. - Require regular fuel deliveries. - Would contribute to poor urban air quality.
Conclusion	The technology is not deemed as being suitable for use within the proposed development.

7.8 On review of the above renewable and low carbon technologies, the use of PV panels is recommended as being the most viable and cost-effective technology for use within the development. This will provide a local source of renewable electricity for occupant use as well as a significant and affordable reduction in the calculated carbon dioxide emissions.

7.9 It is therefore proposed to fit PV panels with a total minimum output capacity of 9.20 kWp. It is initially proposed that this will comprise of 23 x 400 W panels being installed on the Southeast-facing pitched roof and flat roof spaces.

8.0 Proposed Energy Strategy and Performance – Green Measures

- 8.1 Having identified the use of photovoltaic (PV) panels as being the most suitable renewable technology for use within the development, the 'lean' SAP calculations detailed in Section 5.0 were updated to incorporate the PV proposals outlined in paragraph 5.9.
- 8.2 The key results of the Proposed (Green) Calculations are summarised in Table 6 below with the full SAP Worksheets provided in Appendix 3 for detailed review:

Table 6: Proposed 'Green' Annual Energy Consumption and CO ₂ Emissions (SAP 10)			
Dwelling	Floor Area (m ²)	Annual Regulated Energy Consumption (kWhr/year)	Annual Regulated CO ₂ Emissions (kg/year)
Flat 1	48.58	3,500.70	573.38
Flat 2	73.52	4,543.10	741.99
Flat 3	107.91	6,431.99	1,028.27
Totals		14,475.79	2,343.64

As a result of installing the low carbon and renewable technology specified within Section 7.0 the proposed development will have a total annual level of regulated CO₂ emissions of **2,343.64 kgCO₂/year**.

9.0 Energy Calculation Summary

- 9.1 The results of the various Energy Calculations detailed within this report are summarised within the tables below:

Table 7: Carbon Dioxide Emissions after each stage of the Energy Hierarchy		
	Carbon dioxide emissions (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Approved Document L1 2021 of the Building Regulations Compliant Development	3.779	0.488
After energy demand reduction	3.296	0.488
After CHP	3.296	0.488
After renewable energy	2.344	0.488

Table 8: Regulated carbon dioxide savings from each stage of the Energy Hierarchy		
	Regulated Carbon Dioxide savings	
	(Tonnes CO ₂ per annum)	%
Savings from energy demand reduction	0.484	12.80
Savings from CHP	0.000	0.000
Savings from renewable energy	0.952	25.19
Cumulative On-Site Savings	1.436	37.99
Carbon shortfall	2.344	62.01
Carbon Shortfall Cash-in-lieu Contribution		
Cumulative shortfall over 30 year assumed lifetime	70.32 tCO₂	
Cash-in-lieu contribution	£6,680.40	

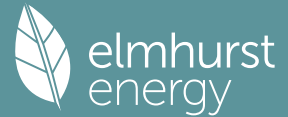
- 9.2 It is evident that the proposed development achieves on-site savings of **37.99%**, which is believed to be the maximum amount of on-site savings that are technically feasible and economically viable.
- 9.3 Therefore the remaining **2.344** tonnes of CO₂ per annum for the assumed lifetime of the residential development's services (30 years) will be met by multiplying the cumulative shortfall (**70.32 tCO₂**) by the CO₂ off-set price of £95 per tonne. This will result in a cash-in-lieu contribution of **£6,680.40** for the proposed development.
- 9.4 In the circumstances, the proposed development is deemed to comply with the mandatory requirements of Policy *SI 2: Minimising Carbon Dioxide Emissions* of The London Plan 2021 and the London Borough of Haringey's Strategic Policy *SP4: Working Towards a Low Carbon Haringey*.



Appendix 1:

Baseline DER Calculations (SAP 10 Derived)

Full SAP Calculation Printout



Plot Reference	24396-1			Issued on Date	17/04/2026
Assessment Reference	Baseline	Plot Type Ref	EST		
Plot Address	Flat 1, 1, Lakefield Road, London, N22 6RR			SAP Version	10.2
SAP Rating	38 F	DER	19.36	TER	
Environmental	87 B	% DER < TER			N/A
CO ₂ Emissions (t/year)	0.8	DFEE	87.08	TFEE	
Compliance Check	N/A	% DFEE < TFEE			
% DPER < TPER		DPER	201.34	TPER	
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	24396, Ibi Ekineh				

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	48.5800	2.5000	121.4500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.5800		
Dwelling volume			

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1647 (8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.9147	(18)
Number of sides sheltered		3	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7089	(21)

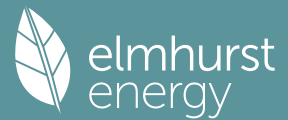
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.9038	0.8861	0.8684	0.7798	0.7620	0.6734	0.6734	0.6557	0.7089	0.7620	0.7975	0.8329 (22b)
Effective ac	0.9084	0.8926	0.8770	0.8040	0.7904	0.7268	0.7268	0.7150	0.7513	0.7904	0.8180	0.8469 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			12.6000	1.5038	18.9474		(27)
Door			1.9100	0.3600	0.6876		(26)
xFloor			21.4800	0.3600	7.7328	110.0000	2362.8000 (28a)
nFloor			27.1000	0.1800	4.8780	110.0000	2981.0000 (28a)
xWall	10.8600	3.1000	7.7600	0.3000	2.3280	9.0000	69.8400 (29a)
pWall	37.1500	9.5000	27.6500	0.2600	7.1890	110.0000	3041.5002 (29a)
Wall to Hall	15.6300	1.9100	13.7200	0.1800	2.4696	18.0000	246.9600 (29a)
Flat	8.3800		8.3800	0.1500	1.2570	9.0000	75.4200 (30)
Total net area of external elements A _{um} (A, m ²)			120.6000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	45.4894			(33)
Main dwelling							
Party Wall			16.3700	0.0000	0.0000	70.0000	1145.9001 (32)
Party Ceiling			40.2000			20.0000	804.0000 (32b)
B			21.0000			100.0000	2100.0000 (32c)
T			65.4000			9.0000	588.6000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13416.0202	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		276.1634	(35)
Thermal bridges (Default value 0.200 * total exposed area)		24.1200	(36)
Point Thermal bridges	(36a) =	0.0000	

Full SAP Calculation Printout



Total fabric heat loss (33) + (36) + (36a) = 69.6094 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4089	35.7733	35.1502	32.2237	31.6761	29.1272	29.1272	28.6552	30.1090	31.6761	32.7838	33.9418 (38)
Heat transfer coeff	106.0183	105.3827	104.7596	101.8331	101.2855	98.7366	98.7366	98.2646	99.7184	101.2855	102.3932	103.5512 (39)
Average = Sum(39)m / 12 =												101.8304

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	2.1823	2.1693	2.1564	2.0962	2.0849	2.0325	2.0325	2.0227	2.0527	2.0849	2.1077	2.1316 (40)
HLP (average)												2.0961
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6484 (42)

Hot water usage for mixer showers 69.5025 68.4384 66.8703 64.4579 62.2965 59.2727 56.8810 59.6770 61.0833 64.0782 67.1972 69.4399 (42a)

Hot water usage for baths 21.9238 21.5928 21.1220 20.4169 19.7815 18.9067 18.2431 19.0546 19.4805 20.3472 21.2484 21.9064 (42b)

Hot water usage for other uses 31.5111 30.3652 29.2194 28.0735 26.9277 25.7818 25.7818 26.9277 28.0735 29.2194 30.3652 31.5111 (42c)

Average daily hot water use (litres/day) 113.0509 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	122.9374	120.3965	117.2117	112.9484	109.0057	103.9612	100.9060	105.6593	108.6373	113.6449	118.8108	122.8573 (44)
Energy conte	180.9851	159.3089	167.4931	147.5388	140.4648	120.2277	111.5041	124.3629	126.0138	146.4429	160.5768	180.4250 (45)
Energy content (annual)										Total = Sum(45)m =		1765.3439
Distribution loss (46)m = 0.15 x (45)m	27.1478	23.8963	25.1240	22.1308	21.0697	18.0342	16.7256	18.6544	18.9021	21.9664	24.0865	27.0637 (46)
Water storage loss (or HIU loss):												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.3000 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												1.3800 (55)
Total storage loss	42.7800	38.6400	42.7800	41.4000	42.7800	41.4000	42.7800	42.7800	41.4000	42.7800	41.4000	42.7800 (56)
If cylinder contains dedicated solar storage	42.7800	38.6400	42.7800	41.4000	42.7800	41.4000	42.7800	42.7800	41.4000	42.7800	41.4000	42.7800 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	223.7651	197.9489	210.2731	188.9388	183.2448	161.6277	154.2841	167.1429	167.4138	189.2229	201.9768	223.2050 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	223.7651	197.9489	210.2731	188.9388	183.2448	161.6277	154.2841	167.1429	167.4138	189.2229	201.9768	223.2050 (64)
Total per year (kWh/year)												2269.0439 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	94.4015	83.8822	89.9154	82.1766	80.9286	73.0957	71.2991	75.5747	75.0196	82.9163	86.5118	94.2153 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	72.4028	80.1602	72.4028	74.8162	72.4028	74.8162	72.4028	72.4028	74.8162	72.4028	74.8162	72.4028 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	143.5466	145.0362	141.2825	133.2914	123.2041	113.7235	107.3898	105.9003	109.6539	117.6450	127.7323	137.2130 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354 (71)
Water heating gains (Table 5)	126.8838	124.8247	120.8541	114.1342	108.7749	101.5218	95.8321	101.5789	104.1939	111.4466	120.1553	126.6335 (72)
Total internal gains	393.5590	400.7469	385.2652	372.9676	355.1076	337.7873	323.3505	327.6077	336.3898	352.2201	373.4295	386.9750 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	0.6000	10.6334	0.6300	0.7000	0.7700	1.9498 (74)						
Southeast	4.8000	36.7938	0.6300	0.7000	0.7700	53.9744 (77)						
West	0.6000	19.6403	0.6300	0.7000	0.7700	3.6014 (80)						
Northwest	6.6000	11.2829	0.6300	0.7000	0.7700	22.7582 (81)						
Solar gains	82.2839	149.0347	227.1911	320.0267	393.2689	405.6437	384.7574	327.8510	259.0160	171.0195	100.1805	69.3634 (83)
Total gains	475.8428	549.7816	612.4562	692.9944	748.3766	743.4310	708.1079	655.4587	595.4058	523.2396	473.6101	456.3384 (84)

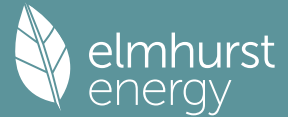
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

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

Full SAP Calculation Printout



tau	35.1512	35.3632	35.5736	36.5959	36.7937	37.7436	37.7436	37.9249	37.3720	36.7937	36.3957	35.9887
alpha	3.3434	3.3575	3.3716	3.4397	3.4529	3.5162	3.5162	3.5283	3.4915	3.4529	3.4264	3.3992
util living area	0.9909	0.9845	0.9716	0.9345	0.8551	0.7115	0.5657	0.6188	0.8299	0.9530	0.9845	0.9922 (86)
MIT	18.7444	18.9900	19.3896	19.9722	20.4682	20.8173	20.9399	20.9175	20.6569	20.0231	19.3203	18.7490 (87)
Th 2	19.2145	19.2229	19.2311	19.2700	19.2773	19.3118	19.3118	19.3182	19.2985	19.2773	19.2625	19.2471 (88)
util rest of house	0.9873	0.9783	0.9594	0.9046	0.7851	0.5746	0.3703	0.4239	0.7207	0.9250	0.9771	0.9891 (89)
MIT 2	17.2846	17.5327	17.9307	18.5155	18.9605	19.2442	19.3020	19.3023	19.1405	18.5819	17.8889	17.3111 (90)
Living area fraction	17.9598	18.2067	18.6055	19.1893	19.6578	19.9718	20.0596	20.0494	19.8419	19.2485	18.5509	0.4625 (91)
MIT												17.9762 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.8098	18.0567	18.4555	19.0393	19.5078	19.8218	19.9096	19.8994	19.6919	19.0985	18.4009	17.8262 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9831	0.9725	0.9521	0.8994	0.7963	0.6209	0.4446	0.4976	0.7512	0.9211	0.9718	0.9853	(94)
Useful gains	467.7949	534.6526	583.1164	623.3108	595.9440	461.6160	314.8117	326.1243	447.2734	481.9583	460.2476	449.6366	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1432.2899	1386.4929	1252.4519	1032.5116	790.8202	515.5866	326.7778	343.8662	557.6152	860.7783	1157.1401	1411.0074	(97)
Space heating kWh	717.5843	572.4367	497.9856	294.6245	144.9879	0.0000	0.0000	0.0000	0.0000	281.8421	501.7626	715.2599	(98a)
Space heating requirement - total per year (kWh/year)												3726.4836	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	717.5843	572.4367	497.9856	294.6245	144.9879	0.0000	0.0000	0.0000	0.0000	281.8421	501.7626	715.2599	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3726.4836	
Space heating per m2										(98c) / (4) =		76.7082	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	717.5843	572.4367	497.9856	294.6245	144.9879	0.0000	0.0000	0.0000	0.0000	281.8421	501.7626	715.2599	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	717.5843	572.4367	497.9856	294.6245	144.9879	0.0000	0.0000	0.0000	0.0000	281.8421	501.7626	715.2599	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating													
Water heating requirement	223.7651	197.9489	210.2731	188.9388	183.2448	161.6277	154.2841	167.1429	167.4138	189.2229	201.9768	223.2050	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	223.7651	197.9489	210.2731	188.9388	183.2448	161.6277	154.2841	167.1429	167.4138	189.2229	201.9768	223.2050	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	32.7717	26.2907	23.6718	17.3430	13.3962	10.9448	12.2205	15.8847	20.6326	27.0711	30.5767	33.6825	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year													
Space heating fuel - main system 1												3726.4836	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												2269.0439	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												264.4863	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												6301.0138	(238)

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----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3726.4836	0.1548	576.7017	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2269.0439	0.1409	319.8045	(264)
Space and water heating			896.5061	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	264.4863	0.1443	38.1735	(268)
Total CO2, kg/year			940.3669	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			19.3600	(273)

----- 13a. Primary energy - Individual heating systems including micro-CHP -----

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3726.4836	1.5730	5861.5891	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2269.0439	1.5212	3451.5674	(278)
Space and water heating			9313.1566	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	264.4863	1.5338	405.6779	(282)
Total Primary energy kWh/year			9780.8593	(286)
Dwelling Primary energy Rate (DPER)			201.3400	(287)

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Plot Reference	24396-2			Issued on Date	17/04/2026
Assessment Reference	Baseline	Plot Type Ref	EST		
Plot Address	Flat 2, 1, Lakefield Road, London, N22 6RR			SAP Version	10.2
SAP Rating	37 F	DER	16.39	TER	
Environmental	87 B	% DER < TER			N/A
CO ₂ Emissions (t/year)	1.02	DFEE	77.75	TFEE	
Compliance Check	N/A	% DFEE < TFEE			
% DPER < TPER		DPER	169.85	TPER	
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	24396, Ibi Ekineh				

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	73.5200 (1b)	2.5000 (2b)	183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	183.8000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1632 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9132 (18)
Number of sides sheltered	3 (19)

Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7077 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9024	0.8847	0.8670	0.7785	0.7608	0.6724	0.6724	0.6547	0.7077	0.7608	0.7962	0.8316 (22b)
Effective ac	0.9071	0.8913	0.8758	0.8030	0.7894	0.7260	0.7260	0.7143	0.7505	0.7894	0.8170	0.8458 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			16.0400	1.5038	24.1203		(27)
Roof Light			5.4000	2.0221	10.9191		(27a)
Door (sheltered)			1.9100	0.3600	0.6876		(26)
xFloor			31.7500	0.2100	6.6675	110.0000	3492.5000 (28a)
pFloor			41.7700	0.1800	7.5186	110.0000	4594.7000 (28a)
xWall	7.8300	5.3800	2.4500	0.3000	0.7350	9.0000	22.0500 (29a)
pWall	43.7000	10.6600	33.0400	0.2600	8.5904	110.0000	3634.4001 (29a)
Wall to Hall	6.3300	1.9100	4.4200	0.1800	0.7956	9.0000	39.7800 (29a)
Flat	50.2600	5.4000	44.8600	0.1500	6.7290	9.0000	403.7400 (30)
Total net area of external elements Aum (A, m ²)			181.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	66.7631		(33)
Main dwelling							
Party Wall			44.7000	0.0000	0.0000	70.0000	3129.0001 (32)
Party Ceiling			23.2600			20.0000	465.2000 (32b)
T			144.8000			9.0000	1303.2000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17084.5702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		232.3799 (35)
Thermal bridges (Default value 0.200 * total exposed area)		36.3280 (36)
Point Thermal bridges	(36a) =	0.0000

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Total fabric heat loss (33) + (36) + (36a) = 103.0911 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	55.0218	54.0628	53.1229	48.7080	47.8820	44.0368	44.0368	43.3247	45.5179	47.8820	49.5530	51.3000 (38)
Average = Sum(39)m / 12 =	158.1129	157.1540	156.2140	151.7991	150.9731	147.1279	147.1279	146.4159	148.6091	150.9731	152.6441	154.3911 (39)
												151.7952
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.1506	2.1376	2.1248	2.0647	2.0535	2.0012	2.0012	1.9915	2.0213	2.0535	2.0762	2.1000 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3285 (42)
Hot water usage for mixer showers													
	84.7853	83.4873	81.5743	78.6315	75.9948	72.3061	69.3885	72.7993	74.5148	78.1683	81.9731	84.7089	(42a)
Hot water usage for baths	26.7180	26.3147	25.7409	24.8817	24.1073	23.0413	22.2325	23.2215	23.7405	24.7968	25.8950	26.6969	(42b)
Hot water usage for other uses	38.4758	37.0767	35.6775	34.2784	32.8793	31.4802	31.4802	32.8793	34.2784	35.6775	37.0767	38.4758	(42c)
Average daily hot water use (litres/day)													137.9175 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	149.9792	146.8787	142.9928	137.7916	132.9814	126.8275	123.1012	128.9001	132.5337	138.6426	144.9448	149.8815	(44)
Energy content (annual)	220.7953	194.3502	204.3338	179.9903	171.3600	146.6718	136.0305	151.7178	153.7325	178.6550	195.8977	220.1120	(45)
Distribution loss (46)m = 0.15 x (45)m													
	33.1193	29.1525	30.6501	26.9985	25.7040	22.0008	20.4046	22.7577	23.0599	26.7983	29.3846	33.0168	(46)
Water storage loss (or HIU loss):													
Store volume													210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.3000 (48)
Temperature factor from Table 2b													0.6000 (49)
Enter (49) or (54) in (55)													1.3800 (55)
Total storage loss	42.7800	38.6400	42.7800	41.4000	42.7800	41.4000	42.7800	42.7800	41.4000	42.7800	41.4000	42.7800	(56)
If cylinder contains dedicated solar storage	42.7800	38.6400	42.7800	41.4000	42.7800	41.4000	42.7800	42.7800	41.4000	42.7800	41.4000	42.7800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	263.5753	232.9902	247.1138	221.3903	214.1400	188.0718	178.8105	194.4978	195.1325	221.4350	237.2977	262.8920	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	263.5753	232.9902	247.1138	221.3903	214.1400	188.0718	178.8105	194.4978	195.1325	221.4350	237.2977	262.8920	(64)
12Total per year (kWh/year)													2657.3468 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	107.6384	95.5334	102.1650	92.9668	91.2012	81.8884	79.4541	84.6702	84.2361	93.6268	98.2560	107.4112	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.5852	114.6836	103.5852	107.0381	103.5852	107.0381	103.5852	103.5852	107.0381	103.5852	107.0381	103.5852	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	144.6753	142.1629	137.3185	129.1205	122.5823	113.7339	106.7932	113.8040	116.9945	125.8425	136.4666	144.3700	(72)
Total internal gains	514.5567	525.2738	503.9608	487.7829	463.3601	441.4008	421.9458	426.8255	438.8392	458.6670	487.1757	505.1899	(73)

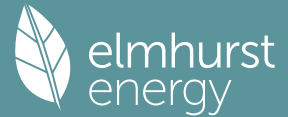
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast					2.8700	11.2829	0.6300	0.7000		0.7700		9.8964 (75)
Southeast					3.8200	36.7938	0.6300	0.7000		0.7700		42.9547 (77)
Southwest					9.3500	36.7938	0.6300	0.7000		0.7700		105.1377 (79)
South					5.4000	26.0000	0.6300	0.7000		1.0000		55.7248 (82)
Solar gains	213.7135	388.1365	587.1944	808.7485	970.6353	989.6139	943.4580	820.3572	664.4214	444.8698	260.5603	179.8265 (83)
Total gains	728.2702	913.4102	1091.1552	1296.5314	1433.9954	1431.0147	1365.4039	1247.1827	1103.2605	903.5368	747.7360	685.0165 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

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tau	30.0147	30.1979	30.3796	31.2631	31.4342	32.2557	32.2557	32.4126	31.9342	31.4342	31.0900	30.7383
alpha	3.0010	3.0132	3.0253	3.0842	3.0956	3.1504	3.1504	3.1608	3.1289	3.0956	3.0727	3.0492
util living area	0.9847	0.9698	0.9399	0.8676	0.7478	0.5849	0.4492	0.5016	0.7294	0.9144	0.9733	0.9872 (86)
MIT	18.5106	18.8673	19.3890	20.0657	20.5638	20.8613	20.9550	20.9364	20.7083	20.0217	19.1739	18.4977 (87)
Th 2	19.2348	19.2432	19.2514	19.2905	19.2979	19.3325	19.3325	19.3390	19.3191	19.2979	19.2830	19.2675 (88)
util rest of house	0.9796	0.9598	0.9197	0.8235	0.6661	0.4594	0.2900	0.3371	0.6126	0.8749	0.9627	0.9829 (89)
MIT 2	17.1018	17.4567	17.9667	18.6217	19.0456	19.2809	19.3245	19.3259	19.1873	18.6107	17.7898	17.1104 (90)
Living area fraction	17.6349	17.9905	18.5049	19.1681	19.6201	19.8790	19.9415	19.9353	19.7628	19.1446	18.3135	0.3784 (91)
MIT	17.6349	17.9905	18.5049	19.1681	19.6201	19.8790	19.9415	19.9353	19.7628	19.1446	18.3135	17.6354 (92)
Temperature adjustment	17.4849	17.8405	18.3549	19.0181	19.4701	19.7290	19.7915	19.7853	19.6128	18.9946	18.1635	-0.1500
adjusted MIT	17.4849	17.8405	18.3549	19.0181	19.4701	19.7290	19.7915	19.7853	19.6128	18.9946	18.1635	17.4854 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9719	0.9485	0.9059	0.8149	0.6755	0.4916	0.3360	0.3842	0.6361	0.8657	0.9527	0.9762 (94)
Useful gains	707.7844	866.4059	988.4755	1056.5991	968.6369	703.5198	458.7530	479.1444	701.7733	782.1905	712.3671	668.7228 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	2084.7044	2033.6437	1851.9059	1535.9160	1173.0727	754.6120	469.5530	495.6621	819.2536	1267.3598	1688.7819	2051.1433 (97)
Space heating kWh	1024.4284	784.3838	642.3922	345.1081	152.1002	0.0000	0.0000	0.0000	0.0000	360.9660	703.0186	1028.5208 (98a)
Space heating requirement - total per year (kWh/year)												5040.9183
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1024.4284	784.3838	642.3922	345.1081	152.1002	0.0000	0.0000	0.0000	0.0000	360.9660	703.0186	1028.5208 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5040.9183
Space heating per m2										(98c) / (4) =		68.5653 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1024.4284	784.3838	642.3922	345.1081	152.1002	0.0000	0.0000	0.0000	0.0000	360.9660	703.0186	1028.5208 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	1024.4284	784.3838	642.3922	345.1081	152.1002	0.0000	0.0000	0.0000	0.0000	360.9660	703.0186	1028.5208 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	263.5753	232.9902	247.1138	221.3903	214.1400	188.0718	178.8105	194.4978	195.1325	221.4350	237.2977	262.8920 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	263.5753	232.9902	247.1138	221.3903	214.1400	188.0718	178.8105	194.4978	195.1325	221.4350	237.2977	262.8920 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	35.7451	28.6760	25.8196	18.9165	14.6117	11.9379	13.3293	17.3259	22.5046	29.5273	33.3510	36.7385 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												5040.9183 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												2657.3468 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												288.4833 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												8027.7483 (238)

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----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5040.9183	0.1553	783.0930 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2657.3468	0.1410	374.7799 (264)
Space and water heating			1157.8729 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	288.4833	0.1443	41.6371 (268)
Total CO2, kg/year			1205.1972 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.3900 (273)

----- 13a. Primary energy - Individual heating systems including micro-CHP -----

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	5040.9183	1.5751	7940.0605 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2657.3468	1.5215	4043.1621 (278)
Space and water heating			11983.2226 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	288.4833	1.5338	442.4853 (282)
Total Primary energy kWh/year			12487.7327 (286)
Dwelling Primary energy Rate (DPER)			169.8500 (287)

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Plot Reference	24396-3			Issued on Date	17/04/2026
Assessment Reference	Baseline	Plot Type Ref	EST		
Plot Address	Flat 3, 1, Lakefield Road, London, N22 6RR			SAP Version	10.2
SAP Rating	35 F	DER	15.13	TER	
Environmental	86 B	% DER < TER			N/A
CO ₂ Emissions (t/year)	1.39	DFEE	76.67	TFEE	
Compliance Check	N/A	% DFEE < TFEE			
% DPER < TPER		DPER	156.51	TPER	
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	24396, Ibi Ekineh				

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	2.4200 (1b)	x 2.5000 (2b)	= 6.0500 (1b) - (3b)
First floor	73.0400 (1c)	x 2.3500 (2c)	= 171.6440 (1c) - (3c)
Second floor	32.5200 (1d)	x 2.0300 (2d)	= 66.0156 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	107.9800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	243.7096 (5)

2. Ventilation rate

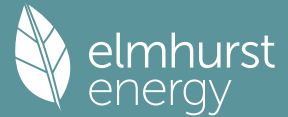
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1641 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9141 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7085 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.9033	0.8856	0.8679	0.7793	0.7616	0.6730	0.6730	0.6553	0.7085	0.7616	0.7970	0.8324 (22b)
Effective ac	0.9080	0.8921	0.8766	0.8037	0.7900	0.7265	0.7265	0.7147	0.7510	0.7900	0.8176	0.8465 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			20.7400	1.5038	31.1880		(27)
Roof Light			3.5300	2.0221	7.1379		(27a)
Floor over Hall			6.2700	0.1639	1.0279	20.0000	125.4000 (28b)
nFloor			27.1000	0.7000	18.9700	110.0000	2981.0000 (28a)
xWall	43.1400	11.7000	31.4400	0.3000	9.4320	9.0000	282.9600 (29a)
pWall	33.9500	7.8400	26.1100	0.2600	6.7886	110.0000	2872.1001 (29a)
Wall to Hall	11.0300		11.0300	0.1800	1.9854	9.0000	99.2700 (29a)
nDormer Wall	8.5800	1.2000	7.3800	0.2600	1.9188	9.0000	66.4200 (29a)
nRoof Void Studs	28.3900		28.3900	0.2300	6.5297	9.0000	255.5100 (29a)
Flat	7.1900		7.1900	0.1500	1.0785	9.0000	64.7100 (30)
nPlane	4.5500		4.5500	0.1500	0.6825	9.0000	40.9500 (30)
Sloped	35.0600	3.5300	31.5300	0.1500	4.7295	9.0000	283.7700 (30)
pshPlane	30.6900		30.6900	0.1395	4.2823	9.0000	276.2100 (30)
Total net area of external elements Aum(A, m ²)			235.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		95.7510		(33)
Main dwelling							
Party Wall			45.0600	0.0000	0.0000	70.0000	3154.2001 (32)
Party Floor			64.3500			30.0000	1930.5000 (32d)

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Party Ceiling	40.2000	20.0000	804.0000 (32b)
B	30.6400	100.0000	3063.9999 (32c)
T1	132.4000	9.0000	1191.5999 (32c)
T2	17.1700	9.0000	154.5300 (32c)
Internal Floor	34.9400	18.0000	628.9200 (32d)
Internal Ceiling	34.9400	9.0000	314.4600 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Default value 0.200 * total exposed area)
Point Thermal Bridges
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) = 18590.5101 (34)
172.1662 (35)
47.1900 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 142.9410 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	73.0213	71.7473	70.4985	64.6329	63.5355	58.4268	58.4268	57.4808	60.3946	63.5355	65.7556	68.0766	(38)
Heat transfer coeff	215.9623	214.6883	213.4395	207.5740	206.4766	201.3679	201.3679	200.4218	203.3356	206.4766	208.6966	211.0176	(39)
Average = Sum(39)m / 12 =												207.5687	
HLP	2.0000	1.9882	1.9767	1.9223	1.9122	1.8649	1.8649	1.8561	1.8831	1.9122	1.9327	1.9542	(40)
HLP (average)												1.9223	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8021 (42)
Hot water usage for mixer showers	95.4299	93.9689	91.8158	88.5035	85.5358	81.3839	78.1001	81.9391	83.8699	87.9821	92.2646	95.3439	(42a)
Hot water usage for baths	30.0573	29.6036	28.9581	27.9914	27.1203	25.9210	25.0112	26.1237	26.7076	27.8959	29.1314	30.0335	(42b)
Hot water usage for other uses	43.3267	41.7512	40.1757	38.6002	37.0247	35.4491	35.4491	37.0247	38.6002	40.1757	41.7512	43.3267	(42c)
Average daily hot water use (litres/day)												155.2372	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	168.8140	165.3237	160.9495	155.0951	149.6807	142.7541	138.5604	145.0875	149.1777	156.0537	163.1472	168.7041	(44)
Distribution loss (46)m = 0.15 x (45)m	248.5233	218.7567	229.9936	202.5929	192.8787	165.0903	153.1133	170.7706	173.0387	201.0910	220.4989	247.7543	(45)
Store volume										Total = Sum(45)m =		2424.1024	
a) If manufacturer declared loss factor is known (kWh/day):	37.2785	32.8135	34.4990	30.3889	28.9318	24.7635	22.9670	25.6156	25.9558	30.1637	33.0748	37.1631	(46)
Temperature factor from Table 2b													210.0000 (47)
Enter (49) or (54) in (55)													2.3000 (48)
Total storage loss													0.6000 (49)
If cylinder contains dedicated solar storage													1.3800 (55)
Primary loss	42.7800	38.6400	42.7800	41.4000	42.7800	41.4000	42.7800	42.7800	41.4000	42.7800	41.4000	42.7800	(56)
Combi loss	42.7800	38.6400	42.7800	41.4000	42.7800	41.4000	42.7800	42.7800	41.4000	42.7800	41.4000	42.7800	(57)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
PV diverter	291.3033	257.3967	272.7736	243.9929	235.6587	206.4903	195.8933	213.5506	214.4387	243.8710	261.8989	290.5343	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
12Total per year (kWh/year)	291.3033	257.3967	272.7736	243.9929	235.6587	206.4903	195.8933	213.5506	214.4387	243.8710	261.8989	290.5343	(64)
Electric shower(s)								Total per year (kWh/year) = Sum(64)m =				2927.8024	(64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month													
	116.8580	103.6486	110.6969	100.4822	98.3562	88.0125	85.1342	91.0052	90.6554	101.0868	106.4359	116.6023	(65)

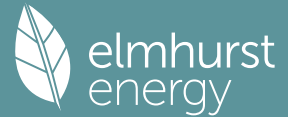
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.4886	150.0052	135.4886	140.0049	135.4886	140.0049	135.4886	135.4886	140.0049	135.4886	140.0049	135.4886	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.6212	271.4087	264.3844	249.4305	230.5540	212.8127	200.9604	198.1730	205.1972	220.1511	239.0277	256.7690	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	(71)
Water heating gains (Table 5)	157.0672	154.2390	148.7861	139.5585	132.1991	122.2396	114.4277	122.3189	125.9102	135.8693	147.8276	156.7235	(72)
Total internal gains	629.2091	643.6850	616.6912	597.0261	566.2738	540.0893	515.9088	521.0125	536.1445	559.5411	594.8922	617.0132	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.1000	10.6334	0.6300	0.7000	0.7700	3.5747 (74)
Southeast	3.2500	36.7938	0.6300	0.7000	0.7700	36.5452 (77)
Southwest	6.1400	36.7938	0.6300	0.7000	0.7700	69.0423 (79)
West	1.1000	19.6403	0.6300	0.7000	0.7700	6.6026 (80)
Northwest	9.1500	11.2829	0.6300	0.7000	0.7700	31.5512 (81)
Southwest	0.8800	37.0308	0.6300	0.7000	1.0000	12.9338 (82)

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Northwest	2.6500				18.0708				0.6300				0.7000				1.0000				19.0066 (82)			
Solar gains	179.2563	328.3021	508.4455	726.4491	899.6663	930.4308	881.5649	747.0033	583.2912	378.9871	218.9317	150.6500 (83)												
Total gains	808.4655	971.9871	1125.1367	1323.4751	1465.9401	1470.5201	1397.4737	1268.0158	1119.4357	938.5282	813.8239	767.6632 (84)												

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	23.9117	24.0536	24.1943	24.8780	25.0103	25.6448	25.6448	25.7658	25.3966	25.0103	24.7442	24.4720
alpha	2.5941	2.6036	2.6130	2.6585	2.6674	2.7097	2.7097	2.7177	2.6931	2.6674	2.6496	2.6315
util living area												
	0.9839	0.9733	0.9536	0.9047	0.8168	0.6806	0.5512	0.6069	0.8055	0.9350	0.9750	0.9860 (86)
MIT	17.9289	18.2508	18.7806	19.5415	20.1961	20.6767	20.8701	20.8285	20.4391	19.5878	18.6662	17.9257 (87)
Th 2	19.3333	19.3412	19.3489	19.3856	19.3925	19.4249	19.4249	19.4310	19.4124	19.3925	19.3786	19.3640 (88)
util rest of house												
	0.9795	0.9660	0.9401	0.8754	0.7558	0.5678	0.3851	0.4430	0.7161	0.9088	0.9668	0.9821 (89)
MIT 2	16.6515	16.9742	17.4997	18.2559	18.8583	19.2716	19.3906	19.3795	19.1008	18.3221	17.4121	16.6671 (90)
Living area fraction												
	0.9795	0.9660	0.9401	0.8754	0.7558	0.5678	0.3851	0.4430	0.7161	0.9088	0.9668	0.9821 (89)
MIT	17.0019	17.3244	17.8511	18.6085	19.2253	19.6570	19.7964	19.7770	19.4679	18.6693	17.7561	17.0124 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8519	17.1744	17.7011	18.4585	19.0753	19.5070	19.6464	19.6270	19.3179	18.5193	17.6061	16.8624 (93)

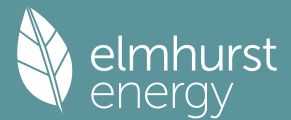
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9692	0.9516	0.9209	0.8531	0.7410	0.5746	0.4112	0.4664	0.7094	0.8886	0.9532	0.9729 (94)
Useful gains	783.5492	924.9803	1036.1809	1129.1112	1086.2857	844.9854	574.6467	591.3741	794.1148	833.9324	775.7680	746.8940 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	2710.7377	2635.1760	2390.7556	1984.0981	1522.8207	988.1156	613.4501	646.7538	1060.9832	1635.1509	2192.5920	2671.9794 (97)
Space heating kWh												
	1433.8282	1149.2515	1007.8036	615.5906	324.7820	0.0000	0.0000	0.0000	0.0000	596.1066	1020.1133	1432.2636 (98a)
Space heating requirement - total per year (kWh/year)												7579.7394
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												
	1433.8282	1149.2515	1007.8036	615.5906	324.7820	0.0000	0.0000	0.0000	0.0000	596.1066	1020.1133	1432.2636 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7579.7394
Space heating per m2												(98c) / (4) = 70.1958 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement												
	1433.8282	1149.2515	1007.8036	615.5906	324.7820	0.0000	0.0000	0.0000	0.0000	596.1066	1020.1133	1432.2636 (98)
Space heating efficiency (main heating system 1)												
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)												
	1433.8282	1149.2515	1007.8036	615.5906	324.7820	0.0000	0.0000	0.0000	0.0000	596.1066	1020.1133	1432.2636 (211)
Space heating efficiency (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement												
	291.3033	257.3967	272.7736	243.9929	235.6587	206.4903	195.8933	213.5506	214.4387	243.8710	261.8989	290.5343 (64)
Efficiency of water heater (217)m												
	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month												
	291.3033	257.3967	272.7736	243.9929	235.6587	206.4903	195.8933	213.5506	214.4387	243.8710	261.8989	290.5343 (219)
Space cooling fuel requirement												
(221)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa												
	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting												
	37.6959	30.2410	27.2287	19.9489	15.4091	12.5894	14.0567	18.2714	23.7328	31.1387	35.1711	38.7435 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												7579.7394 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												2927.8024 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
Total electricity for the above, kWh/year	41.0000 (231)
Electricity for lighting (calculated in Appendix L)	304.2272 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	10852.7690 (238)

----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	7579.7394	0.1545	1171.2554 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2927.8024	0.1411	413.0707 (264)
Space and water heating			1584.3261 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	304.2272	0.1443	43.9094 (268)
Total CO2, kg/year			1633.9227 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.1300 (273)

----- 13a. Primary energy - Individual heating systems including micro-CHP -----

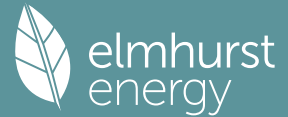
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	7579.7394	1.5721	11916.0225 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2927.8024	1.5217	4455.2118 (278)
Space and water heating			16371.2344 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	304.2272	1.5338	466.6338 (282)
Total Primary energy kWh/year			16899.8930 (286)
Dwelling Primary energy Rate (DPER)			156.5100 (287)



Appendix 2:

Lean DER Calculations (SAP 10 Derived)

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Plot Reference	24396-1			Issued on Date	17/04/2026
Assessment Reference	Lean	Plot Type Ref	EST		
Plot Address	Flat 1, 1, Lakefield Road, London, N22 6RR			SAP Version	10.2
SAP Rating	45 E	DER	17.22	TER	
Environmental	88 B	% DER < TER			N/A
CO ₂ Emissions (t/year)	0.7	DFEE	77.00	TFEE	
Compliance Check	N/A	% DFEE < TFEE			
% DPER < TPER		DPER	179.03	TPER	
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	24396, Ibi Ekineh				

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	48.5800	2.5000	121.4500
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.5800		
Dwelling volume			121.4500

2. Ventilation rate

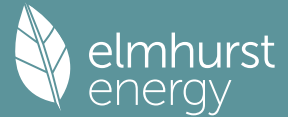
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1647 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9147 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7089 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9038	0.8861	0.8684	0.7798	0.7620	0.6734	0.6734	0.6557	0.7089	0.7620	0.7975	0.8329 (22b)
Effective ac	0.9084	0.8926	0.8770	0.8040	0.7904	0.7268	0.7268	0.7150	0.7513	0.7904	0.8180	0.8469 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			12.6000	1.1450	14.4275		(27)
Door			1.9100	0.3400	0.6494		(26)
xFloor			21.4800	0.3600	7.7328	110.0000	2362.8000 (28a)
pFloor			27.1000	0.1200	3.2520	110.0000	2981.0000 (28a)
xWall	10.8600	3.1000	7.7600	0.3000	2.3280	9.0000	69.8400 (29a)
pWall	37.1500	9.5000	27.6500	0.1800	4.9770	110.0000	3041.5002 (29a)
Wall to Hall	15.6300	1.9100	13.7200	0.1300	1.7836	9.0000	123.4800 (29a)
Flat	8.3800		8.3800	0.1500	1.2570	9.0000	75.4200 (30)
Total net area of external elements Aum(A, m ²)			120.6000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.4073		(33)
Main dwelling							
Party Wall			16.3700	0.0000	0.0000	70.0000	1145.9001 (32)
Party Ceiling			40.2000			20.0000	804.0000 (32b)
B			21.0000			100.0000	2100.0000 (32c)
T			65.4000			9.0000	588.6000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13292.5402 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							273.6216 (35)
Thermal bridges (Default value 0.200 * total exposed area)							24.1200 (36)
Point Thermal bridges						(36a) =	0.0000

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Total fabric heat loss (33) + (36) + (36a) = 60.5273 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.4089	35.7733	35.1502	32.2237	31.6761	29.1272	29.1272	28.6552	30.1090	31.6761	32.7838	33.9418	(38)
Heat transfer coeff	96.9362	96.3006	95.6775	92.7510	92.2034	89.6545	89.6545	89.1825	90.6363	92.2034	93.3111	94.4691	(39)
Average = Sum(39)m / 12 =												92.7484	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9954	1.9823	1.9695	1.9092	1.8980	1.8455	1.8455	1.8358	1.8657	1.8980	1.9208	1.9446	(40)
HLP (average)												1.9092	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6484 (42)

Hot water usage for mixer showers 56.8657 55.9951 54.7121 52.7383 50.9699 48.4958 46.5390 48.8266 49.9772 52.4276 54.9795 56.8144 (42a)

Hot water usage for baths 21.9238 21.5928 21.1220 20.4169 19.7815 18.9067 18.2431 19.0546 19.4805 20.3472 21.2484 21.9064 (42b)

Hot water usage for other uses 31.5111 30.3652 29.2194 28.0735 26.9277 25.7818 25.7818 26.9277 28.0735 29.2194 30.3652 31.5111 (42c)

Average daily hot water use (litres/day) 101.4008 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.3006	107.9532	105.0534	101.2287	97.6790	93.1844	90.5640	94.8089	97.5313	101.9943	106.5932	110.2319	(44)
Energy conte	162.3815	142.8438	150.1192	132.2300	125.8693	107.7646	100.0758	111.5919	113.1314	131.4299	144.0642	161.8836	(45)
Energy content (annual)										Total = Sum(45)m =		1583.3854	
Distribution loss (46)m = 0.15 x (45)m	24.3572	21.4266	22.5179	19.8345	18.8804	16.1647	15.0114	16.7388	16.9697	19.7145	21.6096	24.2825	(46)
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.1400	(55)
Total storage loss	35.3400	31.9200	35.3400	34.2000	35.3400	34.2000	35.3400	35.3400	34.2000	35.3400	34.2000	35.3400	(56)
If cylinder contains dedicated solar storage	35.3400	31.9200	35.3400	34.2000	35.3400	34.2000	35.3400	35.3400	34.2000	35.3400	34.2000	35.3400	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	197.7215	174.7638	185.4592	166.4300	161.2093	141.9646	135.4158	146.9319	147.3314	166.7699	178.2642	197.2236	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	197.7215	174.7638	185.4592	166.4300	161.2093	141.9646	135.4158	146.9319	147.3314	166.7699	178.2642	197.2236	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1999.4854	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	82.2638	73.0316	78.1866	71.3265	70.1235	63.1917	61.5472	65.3763	64.9762	71.9725	75.2614	82.0983	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	72.4028	80.1602	72.4028	74.8162	72.4028	74.8162	72.4028	72.4028	74.8162	72.4028	74.8162	72.4028	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	143.5466	145.0362	141.2825	133.2914	123.2041	113.7235	107.3898	105.9003	109.6539	117.6450	127.7323	137.2130	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	(71)
Water heating gains (Table 5)	110.5697	108.6779	105.0896	99.0646	94.2521	87.7663	82.7248	87.8714	90.2447	96.7372	104.5297	110.3472	(72)
Total internal gains	377.2448	384.6001	369.5006	357.8980	340.5847	324.0318	310.2431	313.9002	322.4406	337.5107	357.8039	370.6887	(73)

6. Solar gains

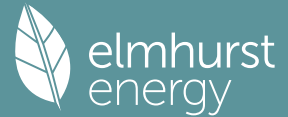
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	4.8000	11.2829	0.6300	0.7000	0.7700	16.5514	(75)						
South	0.6000	46.7521	0.6300	0.7000	0.7700	8.5728	(78)						
Southwest	4.7000	36.7938	0.6300	0.7000	0.7700	52.8500	(79)						
West	0.6000	19.6403	0.6300	0.7000	0.7700	3.6014	(80)						
Northwest	1.9000	11.2829	0.6300	0.7000	0.7700	6.5516	(81)						
Solar gains	88.1272	158.1351	237.3878	328.8994	399.7867	410.6133	390.1730	335.2507	268.7890	180.4684	107.0239	74.4650	(83)
Total gains	465.3721	542.7352	606.8884	686.7974	740.3714	734.6450	700.4161	649.1509	591.2296	517.9791	464.8278	445.1537	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	38.0907	38.3422	38.5919	39.8095	40.0459	41.1845	41.1845	41.4024	40.7383	40.0459	39.5706	39.0855
alpha	3.5394	3.5561	3.5728	3.6540	3.6697	3.7456	3.7456	3.7602	3.7159	3.6697	3.6380	3.6057
util living area	0.9913	0.9843	0.9700	0.9282	0.8395	0.6829	0.5326	0.5853	0.8095	0.9492	0.9845	0.9926 (86)
MIT	18.9212	19.1714	19.5602	20.1181	20.5700	20.8676	20.9606	20.9443	20.7312	20.1485	19.4757	18.9277 (87)
Th 2	19.3364	19.3452	19.3538	19.3945	19.4022	19.4383	19.4383	19.4451	19.4244	19.4022	19.3867	19.3705 (88)
util rest of house	0.9880	0.9782	0.9577	0.8974	0.7692	0.5538	0.3581	0.4090	0.7018	0.9206	0.9774	0.9898 (89)
MIT 2	17.5444	17.7974	18.1844	18.7450	19.1459	19.3889	19.4316	19.4339	19.3004	18.7923	18.1297	17.5745 (90)
Living area fraction	18.1812	18.4329	18.8208	19.3801	19.8046	20.0728	20.1388	20.1325	19.9622	19.4196	18.7522	18.2004 (92)
MIT	18.1812	18.4329	18.8208	19.3801	19.8046	20.0728	20.1388	20.1325	19.9622	19.4196	18.7522	18.2004 (92)
Temperature adjustment	18.0312	18.2829	18.6708	19.2301	19.6546	19.9228	19.9888	19.9825	19.8122	19.2696	18.6022	-0.1500
adjusted MIT	18.0312	18.2829	18.6708	19.2301	19.6546	19.9228	19.9888	19.9825	19.8122	19.2696	18.6022	18.0504 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9841	0.9727	0.9508	0.8935	0.7821	0.5977	0.4228	0.4742	0.7328	0.9175	0.9724	0.9864 (94)
Useful gains	457.9709	527.9427	577.0510	613.6452	579.0762	439.0642	296.1413	307.8121	433.2678	475.2449	452.0131	439.0917 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1331.0550	1288.7829	1164.4677	958.1281	733.4388	477.2171	303.8192	319.4972	517.7345	799.3649	1073.2872	1308.4332 (97)
Space heating kWh	649.5746	511.2847	437.0381	248.0277	114.8458	0.0000	0.0000	0.0000	0.0000	241.1453	447.3174	646.7901 (98a)
Space heating requirement - total per year (kWh/year)												3296.0236
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	649.5746	511.2847	437.0381	248.0277	114.8458	0.0000	0.0000	0.0000	0.0000	241.1453	447.3174	646.7901 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3296.0236
Space heating per m2										(98c) / (4) =		67.8473 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	649.5746	511.2847	437.0381	248.0277	114.8458	0.0000	0.0000	0.0000	0.0000	241.1453	447.3174	646.7901 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	649.5746	511.2847	437.0381	248.0277	114.8458	0.0000	0.0000	0.0000	0.0000	241.1453	447.3174	646.7901 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	197.7215	174.7638	185.4592	166.4300	161.2093	141.9646	135.4158	146.9319	147.3314	166.7699	178.2642	197.2236 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	197.7215	174.7638	185.4592	166.4300	161.2093	141.9646	135.4158	146.9319	147.3314	166.7699	178.2642	197.2236 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	32.7717	26.2907	23.6718	17.3430	13.3962	10.9448	12.2205	15.8847	20.6326	27.0711	30.5767	33.6825 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3296.0236 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1999.4854 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												264.4863 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)

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Total delivered energy for all uses

5600.9952 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3296.0236	0.1550	510.9481 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1999.4854	0.1410	281.8890 (264)
Space and water heating			792.8371 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	264.4863	0.1443	38.1735 (268)
Total CO2, kg/year			836.6978 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			17.2200 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3296.0236	1.5739	5187.6830 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1999.4854	1.5213	3041.8144 (278)
Space and water heating			8229.4974 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	264.4863	1.5338	405.6779 (282)
Total Primary energy kWh/year			8697.2001 (286)
Dwelling Primary energy Rate (DPER)			179.0300 (287)

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Plot Reference	24396-2			Issued on Date	17/04/2026
Assessment Reference	Lean	Plot Type Ref	EST		
Plot Address	Flat 2, 1, Lakefield Road, London, N22 6RR			SAP Version	10.2
SAP Rating	45 E	DER	14.36	TER	
Environmental	88 B	% DER < TER			N/A
CO ₂ Emissions (t/year)	0.88	DFEE	67.73	TFEE	
Compliance Check	N/A	% DFEE < TFEE			
% DPER < TPER		DPER	148.72	TPER	
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	24396, Ibi Ekineh				

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	73.5200 (1b)	2.5000 (2b)	183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	183.8000 (5)

2. Ventilation rate

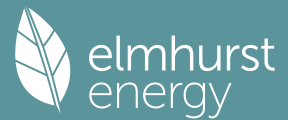
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1632 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9132 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7077 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9024	0.8847	0.8670	0.7785	0.7608	0.6724	0.6724	0.6547	0.7077	0.7608	0.7962	0.8316 (22b)
Effective ac	0.9071	0.8913	0.8758	0.8030	0.7894	0.7260	0.7260	0.7143	0.7505	0.7894	0.8170	0.8458 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			16.0400	1.1450	18.3664		(27)
Roof Light			5.4000	1.1450	6.1832		(27a)
Door (sheltered)			1.9100	0.3400	0.6494		(26)
xFloor			31.7500	0.2100	6.6675	110.0000	3492.5000 (28a)
pFloor			41.7700	0.1200	5.0124	110.0000	4594.7000 (28a)
xWall	7.8300	5.3800	2.4500	0.3000	0.7350	9.0000	22.0500 (29a)
pWall	43.7000	10.6600	33.0400	0.1800	5.9472	110.0000	3634.4001 (29a)
Wall to Hall	6.3300	1.9100	4.4200	0.1300	0.5746	9.0000	39.7800 (29a)
Flat	50.2600	5.4000	44.8600	0.1500	6.7290	9.0000	403.7400 (30)
Total net area of external elements Aum (A, m ²)			181.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8647		(33)
Main dwelling							
Party Wall			44.7000	0.0000	0.0000	70.0000	3129.0001 (32)
Party Ceiling			23.2600			20.0000	465.2000 (32b)
T			144.8000			9.0000	1303.2000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17084.5702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							232.3799 (35)
Thermal bridges (Default value 0.200 * total exposed area)							36.3280 (36)
Point Thermal bridges						(36a) =	0.0000

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Total fabric heat loss (33) + (36) + (36a) = 87.1927 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	55.0218	54.0628	53.1229	48.7080	47.8820	44.0368	44.0368	43.3247	45.5179	47.8820	49.5530	51.3000 (38)
Heat transfer coeff	142.2145	141.2556	140.3156	135.9007	135.0747	131.2295	131.2295	130.5175	132.7107	135.0747	136.7457	138.4927 (39)
Average = Sum(39)m / 12 =												135.8968

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.9344	1.9213	1.9085	1.8485	1.8373	1.7850	1.7850	1.7753	1.8051	1.8373	1.8600	1.8837 (40)
HLP (average)												1.8484
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3285 (42)

Hot water usage for mixer showers 69.3698 68.3078 66.7426 64.3348 62.1776 59.1595 56.7724 59.5631 60.9666 63.9559 67.0689 69.3073 (42a)

Hot water usage for baths 26.7180 26.3147 25.7409 24.8817 24.1073 23.0413 22.2325 23.2215 23.7405 24.7968 25.8950 26.6969 (42b)

Hot water usage for other uses 38.4758 37.0767 35.6775 34.2784 32.8793 31.4802 31.4802 32.8793 34.2784 35.6775 37.0767 38.4758 (42c)

Average daily hot water use (litres/day) 123.7056 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	134.5637	131.6992	128.1611	123.4950	119.1642	113.6810	110.4851	115.6639	118.9856	124.4302	130.0406	134.4799 (44)
Energy conte	198.1010	174.2646	183.1396	161.3153	153.5551	131.4683	122.0893	136.1385	138.0173	160.3409	175.7541	197.4936 (45)
Energy content (annual)										Total = Sum(45)m =		1931.6776
Distribution loss (46)m = 0.15 x (45)m	29.7151	26.1397	27.4709	24.1973	23.0333	19.7202	18.3134	20.4208	20.7026	24.0511	26.3631	29.6240 (46)
Water storage loss (or HIU loss):												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9000 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												1.1400 (55)
Total storage loss	35.3400	31.9200	35.3400	34.2000	35.3400	34.2000	35.3400	35.3400	34.2000	35.3400	34.2000	35.3400 (56)
If cylinder contains dedicated solar storage	35.3400	31.9200	35.3400	34.2000	35.3400	34.2000	35.3400	35.3400	34.2000	35.3400	34.2000	35.3400 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	233.4410	206.1846	218.4796	195.5153	188.8951	165.6683	157.4293	171.4785	172.2173	195.6809	209.9541	232.8336 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	233.4410	206.1846	218.4796	195.5153	188.8951	165.6683	157.4293	171.4785	172.2173	195.6809	209.9541	232.8336 (64)
12Total per year (kWh/year)												2347.7776 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	94.1406	83.4790	89.1659	80.9973	79.3291	71.0732	68.8667	73.5380	73.2508	81.5854	85.7983	93.9386 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.5852	114.6836	103.5852	107.0381	103.5852	107.0381	103.5852	103.5852	107.0381	103.5852	107.0381	103.5852 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385 (71)
Water heating gains (Table 5)	126.5330	124.2247	119.8467	112.4963	106.6251	98.7128	92.5628	98.8415	101.7372	109.6577	119.1642	126.2616 (72)
Total internal gains	496.4144	507.3356	486.4889	471.1587	447.4029	426.3797	407.7154	411.8630	423.5818	442.4822	469.8733	487.0816 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	2.8700	11.2829	0.6300	0.7000	0.7700	9.8964 (75)						
Southeast	3.8200	36.7938	0.6300	0.7000	0.7700	42.9547 (77)						
Southwest	9.3500	36.7938	0.6300	0.7000	0.7700	105.1377 (79)						
South	5.4000	26.0000	0.6300	0.7000	1.0000	55.7248 (82)						
Solar gains	213.7135	388.1365	587.1944	808.7485	970.6353	989.6139	943.4580	820.3572	664.4214	444.8698	260.5603	179.8265 (83)
Total gains	710.1279	895.4721	1073.6833	1279.9072	1418.0383	1415.9936	1351.1734	1232.2202	1088.0032	887.3521	730.4336	666.9081 (84)

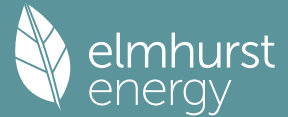
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

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

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tau	33.3701	33.5967	33.8217	34.9204	35.1340	36.1635	36.1635	36.3608	35.7599	35.1340	34.7047	34.2669
alpha	3.2247	3.2398	3.2548	3.3280	3.3423	3.4109	3.4109	3.4241	3.3840	3.3423	3.3136	3.2845
util living area	0.9856	0.9698	0.9369	0.8546	0.7211	0.5480	0.4135	0.4650	0.7014	0.9082	0.9737	0.9882 (86)
MIT	18.7534	19.1105	19.6143	20.2507	20.6814	20.9121	20.9744	20.9623	20.7909	20.1835	19.3845	18.7442 (87)
Th 2	19.3774	19.3863	19.3950	19.4363	19.4440	19.4806	19.4806	19.4874	19.4664	19.4440	19.4283	19.4120 (88)
util rest of house	0.9809	0.9601	0.9166	0.8101	0.6422	0.4353	0.2771	0.3222	0.5907	0.8687	0.9636	0.9843 (89)
MIT 2	17.4358	17.7915	18.2833	18.8987	19.2595	19.4473	19.4757	19.4792	19.3712	18.8663	18.0946	17.4502 (90)
Living area fraction	17.9344	18.2906	18.7870	19.4103	19.7975	20.0016	20.0428	20.0404	19.9084	19.3647	18.5827	17.3998 (91)
MIT												0.3784 (91)
Temperature adjustment												17.9398 (92)
adjusted MIT	17.7844	18.1406	18.6370	19.2603	19.6475	19.8516	19.8928	19.8904	19.7584	19.2147	18.4327	-0.1500 (93)
												17.7898 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9740	0.9498	0.9042	0.8042	0.6536	0.4643	0.3153	0.3619	0.6143	0.8613	0.9545	0.9784 (94)
Useful gains	691.6864	850.5612	970.8321	1029.2616	926.8333	657.5047	426.0527	445.9221	668.3357	764.2685	697.2004	652.4770 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1917.6781	1870.3096	1703.0105	1407.9693	1073.5105	689.1630	432.1102	455.5547	750.9293	1163.6285	1549.6963	1882.0924 (97)
Space heating kWh	912.1379	685.2709	544.7407	272.6696	109.1278	0.0000	0.0000	0.0000	0.0000	297.1238	613.7971	914.8338 (98a)
Space heating requirement - total per year (kWh/year)												4349.7015
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	912.1379	685.2709	544.7407	272.6696	109.1278	0.0000	0.0000	0.0000	0.0000	297.1238	613.7971	914.8338 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4349.7015
Space heating per m2										(98c) / (4) =		59.1635 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	912.1379	685.2709	544.7407	272.6696	109.1278	0.0000	0.0000	0.0000	0.0000	297.1238	613.7971	914.8338 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	912.1379	685.2709	544.7407	272.6696	109.1278	0.0000	0.0000	0.0000	0.0000	297.1238	613.7971	914.8338 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating												
Water heating requirement	233.4410	206.1846	218.4796	195.5153	188.8951	165.6683	157.4293	171.4785	172.2173	195.6809	209.9541	232.8336 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	233.4410	206.1846	218.4796	195.5153	188.8951	165.6683	157.4293	171.4785	172.2173	195.6809	209.9541	232.8336 (219)

Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	35.7451	28.6760	25.8196	18.9165	14.6117	11.9379	13.3293	17.3259	22.5046	29.5273	33.3510	36.7385 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year												
Space heating fuel - main system 1												4349.7015 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												2347.7776 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												288.4833 (232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												7026.9624 (238)

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----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4349.7015	0.1557	677.2739 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2347.7776	0.1411	331.1991 (264)
Space and water heating			1008.4730 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	288.4833	0.1443	41.6371 (268)
Total CO2, kg/year			1055.7973 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.3600 (273)

----- 13a. Primary energy - Individual heating systems including micro-CHP -----

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4349.7015	1.5764	6857.0558 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2347.7776	1.5216	3572.4490 (278)
Space and water heating			10429.5048 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	288.4833	1.5338	442.4853 (282)
Total Primary energy kWh/year			10934.0149 (286)
Dwelling Primary energy Rate (DPER)			148.7200 (287)

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Plot Reference	24396-3			Issued on Date	17/04/2026
Assessment Reference	Lean	Plot Type Ref	EST		
Plot Address	Flat 3, 1, Lakefield Road, London, N22 6RR			SAP Version	10.2
SAP Rating	43 E	DER	12.99	TER	
Environmental	88 B	% DER < TER			N/A
CO ₂ Emissions (t/year)	1.18	DFEE	62.73	TFEE	
Compliance Check	N/A	% DFEE < TFEE			
% DPER < TPER		DPER	134.60	TPER	
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	24396, Ibi Ekineh				

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	2.4200 (1b)	x 2.5000 (2b)	= 6.0500 (1b) - (3b)
First floor	73.0400 (1c)	x 2.3500 (2c)	= 171.6440 (1c) - (3c)
Second floor	32.5200 (1d)	x 2.0300 (2d)	= 66.0156 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	107.9800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	243.7096 (5)

2. Ventilation rate

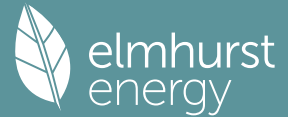
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1641 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9141 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7085 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.9033	0.8856	0.8679	0.7793	0.7616	0.6730	0.6730	0.6553	0.7085	0.7616	0.7970	0.8324 (22b)
Effective ac	0.9080	0.8921	0.8766	0.8037	0.7900	0.7265	0.7265	0.7147	0.7510	0.7900	0.8176	0.8465 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			20.7400	1.1450	23.7481		(27)
Roof Light			3.5300	1.1450	4.0420		(27a)
Floor over Hall			6.2700	0.1505	0.9435	20.0000	125.4000 (28b)
pFloor			27.1000	0.1200	3.2520	110.0000	2981.0000 (28a)
xWall	43.1400	11.7000	31.4400	0.3000	9.4320	9.0000	282.9600 (29a)
pWall	33.9500	7.8400	26.1100	0.1800	4.6998	110.0000	2872.1001 (29a)
Wall to Hall	11.0300		11.0300	0.1300	1.4339	9.0000	99.2700 (29a)
Dormer Wall	8.5800	1.2000	7.3800	0.1500	1.1070	9.0000	66.4200 (29a)
Roof Void Studs	28.3900		28.3900	0.1400	3.9746	9.0000	255.5100 (29a)
Flat	7.1900		7.1900	0.1500	1.0785	9.0000	64.7100 (30)
Plane	4.5500		4.5500	0.1100	0.5005	9.0000	40.9500 (30)
Sloped	35.0600	3.5300	31.5300	0.1500	4.7295	9.0000	283.7700 (30)
shPlane	30.6900		30.6900	0.1043	3.1999	9.0000	276.2100 (30)
Total net area of external elements Aum(A, m ²)			235.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.1413		(33)
Main dwelling							
Party Wall			45.0600	0.0000	0.0000	70.0000	3154.2001 (32)
Party Floor			64.3500			30.0000	1930.5000 (32d)

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Party Ceiling	40.2000	20.0000	804.0000 (32b)
B	30.6400	100.0000	3063.9999 (32c)
T1	132.4000	9.0000	1191.5999 (32c)
T2	17.1700	9.0000	154.5300 (32c)
Internal Floor	34.9400	18.0000	628.9200 (32d)
Internal Ceiling	34.9400	9.0000	314.4600 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Default value 0.200 * total exposed area)
Point Thermal Bridges
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) = 18590.5101 (34)
172.1662 (35)
47.1900 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 109.3313 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	73.0213	71.7473	70.4985	64.6329	63.5355	58.4268	58.4268	57.4808	60.3946	63.5355	65.7556	68.0766 (38)
Heat transfer coeff	182.3526	181.0786	179.8298	173.9642	172.8668	167.7581	167.7581	166.8120	169.7259	172.8668	175.0869	177.4079 (39)
Average = Sum(39)m / 12 =												173.9590

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.6888	1.6770	1.6654	1.6111	1.6009	1.5536	1.5536	1.5448	1.5718	1.6009	1.6215	1.6430 (40)
HLP (average)												1.6110
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8021 (42)
Hot water usage for mixer showers	95.4299	93.9689	91.8158	88.5035	85.5358	81.3839	78.1001	81.9391	83.8699	87.9821	92.2646	95.3439 (42a)
Hot water usage for baths	30.0573	29.6036	28.9581	27.9914	27.1203	25.9210	25.0112	26.1237	26.7076	27.8959	29.1314	30.0335 (42b)
Hot water usage for other uses	43.3267	41.7512	40.1757	38.6002	37.0247	35.4491	35.4491	37.0247	38.6002	40.1757	41.7512	43.3267 (42c)
Average daily hot water use (litres/day)												155.2372 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	168.8140	165.3237	160.9495	155.0951	149.6807	142.7541	138.5604	145.0875	149.1777	156.0537	163.1472	168.7041 (44)
Energy content (annual)	248.5233	218.7567	229.9936	202.5929	192.8787	165.0903	153.1133	170.7706	173.0387	201.0910	220.4989	247.7543 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2424.1024
	37.2785	32.8135	34.4990	30.3889	28.9318	24.7635	22.9670	25.6156	25.9558	30.1637	33.0748	37.1631 (46)
Water storage loss (or HIU loss):												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.3000 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												1.3800 (55)
Total storage loss	42.7800	38.6400	42.7800	41.4000	42.7800	41.4000	42.7800	42.7800	41.4000	42.7800	41.4000	42.7800 (56)
If cylinder contains dedicated solar storage	42.7800	38.6400	42.7800	41.4000	42.7800	41.4000	42.7800	42.7800	41.4000	42.7800	41.4000	42.7800 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	291.3033	257.3967	272.7736	243.9929	235.6587	206.4903	195.8933	213.5506	214.4387	243.8710	261.8989	290.5343 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	291.3033	257.3967	272.7736	243.9929	235.6587	206.4903	195.8933	213.5506	214.4387	243.8710	261.8989	290.5343 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2927.8024 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	116.8580	103.6486	110.6969	100.4822	98.3562	88.0125	85.1342	91.0052	90.6554	101.0868	106.4359	116.6023 (65)

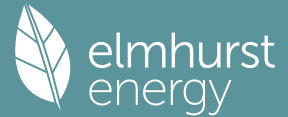
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.4886	150.0052	135.4886	140.0049	135.4886	140.0049	135.4886	135.4886	140.0049	135.4886	140.0049	135.4886 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.6212	271.4087	264.3844	249.4305	230.5540	212.8127	200.9604	198.1730	205.1972	220.1511	239.0277	256.7690 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857 (71)
Water heating gains (Table 5)	157.0672	154.2390	148.7861	139.5585	132.1991	122.2396	114.4277	122.3189	125.9102	135.8693	147.8276	156.7235 (72)
Total internal gains	629.2091	643.6850	616.6912	597.0261	566.2738	540.0893	515.9088	521.0125	536.1445	559.5411	594.8922	617.0132 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.1000	10.6334	0.6300	0.7000	0.7700	3.5747 (74)
Southeast	3.2500	36.7938	0.6300	0.7000	0.7700	36.5452 (77)
Southwest	6.1400	36.7938	0.6300	0.7000	0.7700	69.0423 (79)
West	1.1000	19.6403	0.6300	0.7000	0.7700	6.6026 (80)
Northwest	9.1500	11.2829	0.6300	0.7000	0.7700	31.5512 (81)
Southwest	0.8800	37.0308	0.6300	0.7000	1.0000	12.9338 (82)

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Northwest				2.6500		18.0708		0.6300		0.7000		1.0000		19.0066 (82)	
Solar gains	179.2563	328.3021	508.4455	726.4491	899.6663	930.4308	881.5649	747.0033	583.2912	378.9871	218.9317	150.6500	(83)		
Total gains	808.4655	971.9871	1125.1367	1323.4751	1465.9401	1470.5201	1397.4737	1268.0158	1119.4357	938.5282	813.8239	767.6632	(84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	28.3189	28.5182	28.7162	29.6844	29.8729	30.7826	30.7826	30.9572	30.4257	29.8729	29.4941	29.1082
alpha	2.8879	2.9012	2.9144	2.9790	2.9915	3.0522	3.0522	3.0638	3.0284	2.9915	2.9663	2.9405
util living area	0.9840	0.9721	0.9490	0.8894	0.7829	0.6254	0.4898	0.5462	0.7685	0.9261	0.9738	0.9862 (86)
MIT	18.3786	18.6982	19.1969	19.9005	20.4538	20.8152	20.9356	20.9102	20.6285	19.8973	19.0598	18.3837 (87)
Th 2	19.5489	19.5574	19.5657	19.6052	19.6127	19.6475	19.6475	19.6540	19.6341	19.6127	19.5976	19.5820 (88)
util rest of house	0.9798	0.9649	0.9354	0.8592	0.7229	0.5251	0.3549	0.4093	0.6824	0.8994	0.9659	0.9826 (89)
MIT 2	17.2319	17.5526	18.0468	18.7460	19.2469	19.5580	19.6292	19.6254	19.4245	18.7649	17.9401	17.2585 (90)
Living area fraction	17.5464	17.8668	18.3623	19.0627	19.5779	19.9029	19.9875	19.9778	19.7548	19.0756	18.2472	17.5672 (91)
MIT	17.5464	17.8668	18.3623	19.0627	19.5779	19.9029	19.9875	19.9778	19.7548	19.0756	18.2472	17.5672 (92)
Temperature adjustment	17.3964	17.7168	18.2123	18.9127	19.4279	19.7529	19.8375	19.8278	19.6048	18.9256	18.0972	-0.1500
adjusted MIT	17.3964	17.7168	18.2123	18.9127	19.4279	19.7529	19.8375	19.8278	19.6048	18.9256	18.0972	17.4172 (93)

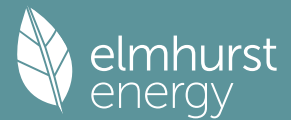
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9706	0.9519	0.9180	0.8406	0.7137	0.5337	0.3751	0.4285	0.6803	0.8817	0.9536	0.9745 (94)
Useful gains	784.6879	925.1952	1032.9141	1112.5080	1046.1924	784.7929	524.1547	543.3193	761.5175	827.5070	776.0613	748.0607 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	2388.1687	2320.8537	2106.2124	1741.8556	1335.9060	864.4397	543.1204	571.8010	934.3071	1439.2114	1925.4727	2344.8283 (97)
Space heating kWh	1192.9898	937.8825	798.5340	453.1303	215.5469	0.0000	0.0000	0.0000	0.0000	455.1081	827.5762	1187.9951 (98a)
Space heating requirement - total per year (kWh/year)												6068.7628
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	1192.9898	937.8825	798.5340	453.1303	215.5469	0.0000	0.0000	0.0000	0.0000	455.1081	827.5762	1187.9951 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6068.7628
Space heating per m2										(98c) / (4) =		56.2027 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1192.9898	937.8825	798.5340	453.1303	215.5469	0.0000	0.0000	0.0000	0.0000	455.1081	827.5762	1187.9951 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	1192.9898	937.8825	798.5340	453.1303	215.5469	0.0000	0.0000	0.0000	0.0000	455.1081	827.5762	1187.9951 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	291.3033	257.3967	272.7736	243.9929	235.6587	206.4903	195.8933	213.5506	214.4387	243.8710	261.8989	290.5343 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	291.3033	257.3967	272.7736	243.9929	235.6587	206.4903	195.8933	213.5506	214.4387	243.8710	261.8989	290.5343 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	37.6959	30.2410	27.2287	19.9489	15.4091	12.5894	14.0567	18.2714	23.7328	31.1387	35.1711	38.7435 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												6068.7628 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												2927.8024 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
Total electricity for the above, kWh/year	41.0000 (231)
Electricity for lighting (calculated in Appendix L)	304.2272 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	9341.7924 (238)

----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	6068.7628	0.1550	940.4460	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2927.8024	0.1411	413.0707	(264)
Space and water heating			1353.5166	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	304.2272	0.1443	43.9094	(268)
Total CO2, kg/year			1403.1132	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.9900	(273)

----- 13a. Primary energy - Individual heating systems including micro-CHP -----

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	6068.7628	1.5737	9550.5157	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2927.8024	1.5217	4455.2118	(278)
Space and water heating			14005.7275	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	304.2272	1.5338	466.6338	(282)
Total Primary energy kWh/year			14534.3861	(286)
Dwelling Primary energy Rate (DPER)			134.6000	(287)



Appendix 3:

Renewable DER Calculations (SAP 10 Derived)

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Plot Reference	24396-1			Issued on Date	17/04/2026
Assessment Reference	Renewable	Plot Type Ref	EST		
Plot Address	Flat 1, 1, Lakefield Road, London, N22 6RR			SAP Version	10.2
SAP Rating	58 D	DER	11.80	TER	
Environmental	92 A	% DER < TER			N/A
CO ₂ Emissions (t/year)	0.42	DFEE	77.59	TFEE	
Compliance Check	N/A	% DFEE < TFEE			
% DPER < TPER		DPER	139.06	TPER	
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	24396, Ibi Ekineh				

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	48.5800 (1b)	2.5000 (2b)	121.4500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	48.5800		121.4500 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 121.4500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1647 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9147 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7089 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9038	0.8861	0.8684	0.7798	0.7620	0.6734	0.6734	0.6557	0.7089	0.7620	0.7975	0.8329 (22b)
Effective ac	0.9084	0.8926	0.8770	0.8040	0.7904	0.7268	0.7268	0.7150	0.7513	0.7904	0.8180	0.8469 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			12.6000	1.1450	14.4275		(27)
Door			1.9100	0.3400	0.6494		(26)
xFloor			21.4800	0.3600	7.7328	110.0000	2362.8000 (28a)
pFloor			27.1000	0.1200	3.2520	110.0000	2981.0000 (28a)
xWall	10.8600	3.1000	7.7600	0.3000	2.3280	9.0000	69.8400 (29a)
pWall	37.1500	9.5000	27.6500	0.1800	4.9770	110.0000	3041.5002 (29a)
Wall to Hall	15.6300	1.9100	13.7200	0.1300	1.7836	9.0000	123.4800 (29a)
Flat	8.3800		8.3800	0.1500	1.2570	9.0000	75.4200 (30)
Total net area of external elements Aum(A, m ²)			120.6000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.4073		(33)
Main dwelling							
Party Wall			16.3700	0.0000	0.0000	70.0000	1145.9001 (32)
Party Ceiling			40.2000			20.0000	804.0000 (32b)
B			21.0000			100.0000	2100.0000 (32c)
T			65.4000			9.0000	588.6000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13292.5402 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							273.6216 (35)
Thermal bridges (Default value 0.200 * total exposed area)							24.1200 (36)
Point Thermal bridges						(36a) =	0.0000

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Total fabric heat loss (33) + (36) + (36a) = 60.5273 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	36.4089	35.7733	35.1502	32.2237	31.6761	29.1272	29.1272	28.6552	30.1090	31.6761	32.7838	33.9418 (38)
Average = Sum(39)m / 12 =	96.9362	96.3006	95.6775	92.7510	92.2034	89.6545	89.6545	89.1825	90.6363	92.2034	93.3111	94.4691 (39)
												92.7484
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.9954	1.9823	1.9695	1.9092	1.8980	1.8455	1.8455	1.8358	1.8657	1.8980	1.9208	1.9446 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6484 (42)											
Hot water usage for mixer showers	56.8657	55.9951	54.7121	52.7383	50.9699	48.4958	46.5390	48.8266	49.9772	52.4276	54.9795	56.8144 (42a)
Hot water usage for baths	21.9238	21.5928	21.1220	20.4169	19.7815	18.9067	18.2431	19.0546	19.4805	20.3472	21.2484	21.9064 (42b)
Hot water usage for other uses	31.5111	30.3652	29.2194	28.0735	26.9277	25.7818	25.7818	26.9277	28.0735	29.2194	30.3652	31.5111 (42c)
Average daily hot water use (litres/day)												101.4008 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	110.3006	107.9532	105.0534	101.2287	97.6790	93.1844	90.5640	94.8089	97.5313	101.9943	106.5932	110.2319 (44)
Energy content (annual)	162.3815	142.8438	150.1192	132.2300	125.8693	107.7646	100.0758	111.5919	113.1314	131.4299	144.0642	161.8836 (45)
Distribution loss (46)m = 0.15 x (45)m	24.3572	21.4266	22.5179	19.8345	18.8804	16.1647	15.0114	16.7388	16.9697	19.7145	21.6096	24.2825 (46)
Water storage loss (or HIU loss):												
Store volume	210.0000 (47)											
a) If manufacturer declared loss factor is known (kWh/day):	1.9000 (48)											
Temperature factor from Table 2b	0.6000 (49)											
Enter (49) or (54) in (55)	1.1400 (55)											
Total storage loss	35.3400	31.9200	35.3400	34.2000	35.3400	34.2000	35.3400	35.3400	34.2000	35.3400	34.2000	35.3400 (56)
If cylinder contains dedicated solar storage	35.3400	31.9200	35.3400	34.2000	35.3400	34.2000	35.3400	35.3400	34.2000	35.3400	34.2000	35.3400 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	197.7215	174.7638	185.4592	166.4300	161.2093	141.9646	135.4158	146.9319	147.3314	166.7699	178.2642	197.2236 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	197.7215	174.7638	185.4592	166.4300	161.2093	141.9646	135.4158	146.9319	147.3314	166.7699	178.2642	197.2236 (64)
12Total per year (kWh/year)	1999.4854 (64)											
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000 (64a)											
Heat gains from water heating, kWh/month	82.2638	73.0316	78.1866	71.3265	70.1235	63.1917	61.5472	65.3763	64.9762	71.9725	75.2614	82.0983 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192	82.4192 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	72.4028	80.1602	72.4028	74.8162	72.4028	74.8162	72.4028	72.4028	74.8162	72.4028	74.8162	72.4028 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	143.5466	145.0362	141.2825	133.2914	123.2041	113.7235	107.3898	105.9003	109.6539	117.6450	127.7323	137.2130 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419	31.2419 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354	-65.9354 (71)
Water heating gains (Table 5)	110.5697	108.6779	105.0896	99.0646	94.2521	87.7663	82.7248	87.8714	90.2447	96.7372	104.5297	110.3472 (72)
Total internal gains	377.2448	384.6001	369.5006	357.8980	340.5847	324.0318	310.2431	313.9002	322.4406	337.5107	357.8039	370.6887 (73)

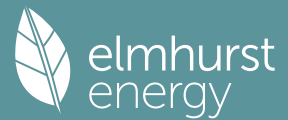
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				0.6000	10.6334	0.6300	0.7000		0.7700		1.9498 (74)	
Southeast				4.8000	36.7938	0.6300	0.7000		0.7700		53.9744 (77)	
West				0.6000	19.6403	0.6300	0.7000		0.7700		3.6014 (80)	
Northwest				6.6000	11.2829	0.6300	0.7000		0.7700		22.7582 (81)	
Solar gains	82.2839	149.0347	227.1911	320.0267	393.2689	405.6437	384.7574	327.8510	259.0160	171.0195	100.1805	69.3634 (83)
Total gains	459.5287	533.6348	596.6917	677.9247	733.8537	729.6755	695.0006	641.7512	581.4566	508.5302	457.9844	440.0521 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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tau	38.0907	38.3422	38.5919	39.8095	40.0459	41.1845	41.1845	41.4024	40.7383	40.0459	39.5706	39.0855
alpha	3.5394	3.5561	3.5728	3.6540	3.6697	3.7456	3.7456	3.7602	3.7159	3.6697	3.6380	3.6057
util living area	0.9917	0.9851	0.9714	0.9306	0.8424	0.6860	0.5360	0.5906	0.8157	0.9517	0.9852	0.9929 (86)
MIT	18.9111	19.1560	19.5439	20.1060	20.5640	20.8655	20.9597	20.9426	20.7233	20.1345	19.4640	18.9187 (87)
Th 2	19.3364	19.3452	19.3538	19.3945	19.4022	19.4383	19.4383	19.4451	19.4244	19.4022	19.3867	19.3705 (88)
util rest of house	0.9884	0.9793	0.9597	0.9006	0.7728	0.5569	0.3607	0.4134	0.7092	0.9243	0.9784	0.9901 (89)
MIT 2	17.5344	17.7824	18.1689	18.7345	19.1415	19.3880	19.4314	19.4335	19.2958	18.7798	18.1184	17.5656 (90)
Living area fraction	18.1712	18.4178	18.8049	19.3689	19.7994	20.0714	20.1383	20.1315	19.9561	19.4064	18.7408	0.4625 (91)
MIT												18.1915 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.0212	18.2678	18.6549	19.2189	19.6494	19.9214	19.9883	19.9815	19.8061	19.2564	18.5908	18.0415 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9847	0.9740	0.9529	0.8965	0.7854	0.6007	0.4258	0.4789	0.7396	0.9210	0.9735	0.9868 (94)
Useful gains	452.4806	519.7464	568.5851	607.7417	576.3535	438.2948	295.9170	307.3331	430.0232	468.3443	445.8679	434.2601 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1330.0808	1287.3229	1162.9502	957.0848	732.9665	477.0863	303.7753	319.4073	517.1769	798.1514	1072.2166	1307.5931 (97)
Space heating kWh	652.9346	515.8115	442.2076	251.5271	116.5201	0.0000	0.0000	0.0000	0.0000	245.3765	450.9711	649.7598 (98a)
Space heating requirement - total per year (kWh/year)												3325.1082
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	652.9346	515.8115	442.2076	251.5271	116.5201	0.0000	0.0000	0.0000	0.0000	245.3765	450.9711	649.7598 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3325.1082
Space heating per m2										(98c) / (4) =		68.4460 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	652.9346	515.8115	442.2076	251.5271	116.5201	0.0000	0.0000	0.0000	0.0000	245.3765	450.9711	649.7598 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	652.9346	515.8115	442.2076	251.5271	116.5201	0.0000	0.0000	0.0000	0.0000	245.3765	450.9711	649.7598 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	197.7215	174.7638	185.4592	166.4300	161.2093	141.9646	135.4158	146.9319	147.3314	166.7699	178.2642	197.2236 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	197.7215	174.7638	185.4592	166.4300	161.2093	141.9646	135.4158	146.9319	147.3314	166.7699	178.2642	197.2236 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	32.7717	26.2907	23.6718	17.3430	13.3962	10.9448	12.2205	15.8847	20.6326	27.0711	30.5767	33.6825 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-35.4649	-59.9662	-102.6680	-126.6235	-134.6171	-109.7900	-107.0624	-100.3241	-83.5411	-71.1392	-41.2579	-29.2193 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.8656	-21.3189	-57.3218	-115.2965	-185.3624	-212.7700	-207.9174	-161.3259	-101.9309	-38.8537	-11.9645	-5.7785 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3325.1082 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1999.4854 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												264.4863 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2129.3798 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												3500.7000 (238)

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----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3325.1082	0.1550	515.3436 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1999.4854	0.1410	281.8890 (264)
Space and water heating			797.2326 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	264.4863	0.1443	38.1735 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1001.6737	0.1339	-134.1149
PV Unit electricity exported	-1127.7061	0.1185	-133.5956
Total			-267.7104 (269)
Total CO2, kg/year			573.3829 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.8000 (273)

----- 13a. Primary energy - Individual heating systems including micro-CHP -----

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3325.1082	1.5738	5233.0461 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1999.4854	1.5213	3041.8144 (278)
Space and water heating			8274.8606 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	264.4863	1.5338	405.6779 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1001.6737	1.4948	-1497.3492
PV Unit electricity exported	-1127.7061	0.4344	-489.8347
Total			-1987.1839 (283)
Total Primary energy kWh/year			6755.3793 (286)
Dwelling Primary energy Rate (DPER)			139.0600 (287)

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Plot Reference	24396-2			Issued on Date	17/04/2026
Assessment Reference	Renewable	Plot Type Ref	EST		
Plot Address	Flat 2, 1, Lakefield Road, London, N22 6RR			SAP Version	10.2
SAP Rating	58 D	DER	10.09	TER	
Environmental	92 A	% DER < TER			N/A
CO ₂ Emissions (t/year)	0.55	DFEE	67.73	TFEE	
Compliance Check	N/A	% DFEE < TFEE			
% DPER < TPER		DPER	116.58	TPER	
Assessor Details	Mr. Samuel Marks			Assessor ID	BP82-0001
Client	24396, Ibi Ekineh				

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	73.5200 (1b)	2.5000 (2b)	183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	183.8000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1632 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9132 (18)
Number of sides sheltered	3 (19)

Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7077 (21)

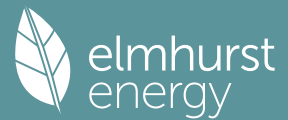
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9024	0.8847	0.8670	0.7785	0.7608	0.6724	0.6724	0.6547	0.7077	0.7608	0.7962	0.8316 (22b)
Effective ac	0.9071	0.8913	0.8758	0.8030	0.7894	0.7260	0.7260	0.7143	0.7505	0.7894	0.8170	0.8458 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			16.0400	1.1450	18.3664		(27)
Roof Light			5.4000	1.1450	6.1832		(27a)
Door (sheltered)			1.9100	0.3400	0.6494		(26)
xFloor			31.7500	0.2100	6.6675	110.0000	3492.5000 (28a)
pFloor			41.7700	0.1200	5.0124	110.0000	4594.7000 (28a)
xWall	7.8300	5.3800	2.4500	0.3000	0.7350	9.0000	22.0500 (29a)
pWall	43.7000	10.6600	33.0400	0.1800	5.9472	110.0000	3634.4001 (29a)
Wall to Hall	6.3300	1.9100	4.4200	0.1300	0.5746	9.0000	39.7800 (29a)
Flat	50.2600	5.4000	44.8600	0.1500	6.7290	9.0000	403.7400 (30)
Total net area of external elements Aum (A, m ²)			181.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.8647		(33)
Main dwelling							
Party Wall			44.7000	0.0000	0.0000	70.0000	3129.0001 (32)
Party Ceiling			23.2600			20.0000	465.2000 (32b)
T			144.8000			9.0000	1303.2000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17084.5702 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		232.3799 (35)
Thermal bridges (Default value 0.200 * total exposed area)		36.3280 (36)
Point Thermal bridges	(36a) =	0.0000

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Total fabric heat loss (33) + (36) + (36a) = 87.1927 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	55.0218	54.0628	53.1229	48.7080	47.8820	44.0368	44.0368	43.3247	45.5179	47.8820	49.5530	51.3000 (38)
Heat transfer coeff	142.2145	141.2556	140.3156	135.9007	135.0747	131.2295	131.2295	130.5175	132.7107	135.0747	136.7457	138.4927 (39)
Average = Sum(39)m / 12 =												135.8968

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.9344	1.9213	1.9085	1.8485	1.8373	1.7850	1.7850	1.7753	1.8051	1.8373	1.8600	1.8837 (40)
HLP (average)												1.8484
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3285 (42)

Hot water usage for mixer showers 69.3698 68.3078 66.7426 64.3348 62.1776 59.1595 56.7724 59.5631 60.9666 63.9559 67.0689 69.3073 (42a)

Hot water usage for baths 26.7180 26.3147 25.7409 24.8817 24.1073 23.0413 22.2325 23.2215 23.7405 24.7968 25.8950 26.6969 (42b)

Hot water usage for other uses 38.4758 37.0767 35.6775 34.2784 32.8793 31.4802 31.4802 32.8793 34.2784 35.6775 37.0767 38.4758 (42c)

Average daily hot water use (litres/day) 123.7056 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	134.5637	131.6992	128.1611	123.4950	119.1642	113.6810	110.4851	115.6639	118.9856	124.4302	130.0406	134.4799 (44)
Energy conte	198.1010	174.2646	183.1396	161.3153	153.5551	131.4683	122.0893	136.1385	138.0173	160.3409	175.7541	197.4936 (45)
Energy content (annual)										Total = Sum(45)m =		1931.6776
Distribution loss (46)m = 0.15 x (45)m	29.7151	26.1397	27.4709	24.1973	23.0333	19.7202	18.3134	20.4208	20.7026	24.0511	26.3631	29.6240 (46)
Water storage loss (or HIU loss):												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9000 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												1.1400 (55)
Total storage loss	35.3400	31.9200	35.3400	34.2000	35.3400	34.2000	35.3400	35.3400	34.2000	35.3400	34.2000	35.3400 (56)
If cylinder contains dedicated solar storage	35.3400	31.9200	35.3400	34.2000	35.3400	34.2000	35.3400	35.3400	34.2000	35.3400	34.2000	35.3400 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	233.4410	206.1846	218.4796	195.5153	188.8951	165.6683	157.4293	171.4785	172.2173	195.6809	209.9541	232.8336 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	233.4410	206.1846	218.4796	195.5153	188.8951	165.6683	157.4293	171.4785	172.2173	195.6809	209.9541	232.8336 (64)
12Total per year (kWh/year)												2347.7776 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	94.1406	83.4790	89.1659	80.9973	79.3291	71.0732	68.8667	73.5380	73.2508	81.5854	85.7983	93.9386 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.5852	114.6836	103.5852	107.0381	103.5852	107.0381	103.5852	103.5852	107.0381	103.5852	107.0381	103.5852 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385 (71)
Water heating gains (Table 5)	126.5330	124.2247	119.8467	112.4963	106.6251	98.7128	92.5628	98.8415	101.7372	109.6577	119.1642	126.2616 (72)
Total internal gains	496.4144	507.3356	486.4889	471.1587	447.4029	426.3797	407.7154	411.8630	423.5818	442.4822	469.8733	487.0816 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	2.8700	11.2829	0.6300	0.7000	0.7700	9.8964 (75)						
Southeast	3.8200	36.7938	0.6300	0.7000	0.7700	42.9547 (77)						
Southwest	9.3500	36.7938	0.6300	0.7000	0.7700	105.1377 (79)						
South	5.4000	26.0000	0.6300	0.7000	1.0000	55.7248 (82)						
Solar gains	213.7135	388.1365	587.1944	808.7485	970.6353	989.6139	943.4580	820.3572	664.4214	444.8698	260.5603	179.8265 (83)
Total gains	710.1279	895.4721	1073.6833	1279.9072	1418.0383	1415.9936	1351.1734	1232.2202	1088.0032	887.3521	730.4336	666.9081 (84)

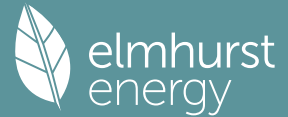
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

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

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tau	33.3701	33.5967	33.8217	34.9204	35.1340	36.1635	36.1635	36.3608	35.7599	35.1340	34.7047	34.2669
alpha	3.2247	3.2398	3.2548	3.3280	3.3423	3.4109	3.4109	3.4241	3.3840	3.3423	3.3136	3.2845
util living area	0.9856	0.9698	0.9369	0.8546	0.7211	0.5480	0.4135	0.4650	0.7014	0.9082	0.9737	0.9882 (86)
MIT	18.7534	19.1105	19.6143	20.2507	20.6814	20.9121	20.9744	20.9623	20.7909	20.1835	19.3845	18.7442 (87)
Th 2	19.3774	19.3863	19.3950	19.4363	19.4440	19.4806	19.4806	19.4874	19.4664	19.4440	19.4283	19.4120 (88)
util rest of house	0.9809	0.9601	0.9166	0.8101	0.6422	0.4353	0.2771	0.3222	0.5907	0.8687	0.9636	0.9843 (89)
MIT 2	17.4358	17.7915	18.2833	18.8987	19.2595	19.4473	19.4757	19.4792	19.3712	18.8663	18.0946	17.4502 (90)
Living area fraction	17.9344	18.2906	18.7870	19.4103	19.7975	20.0016	20.0428	20.0404	19.9084	19.3647	18.5827	17.9398 (91)
MIT												0.3784 (91)
Temperature adjustment												17.9398 (92)
adjusted MIT	17.7844	18.1406	18.6370	19.2603	19.6475	19.8516	19.8928	19.8904	19.7584	19.2147	18.4327	-0.1500
												17.7898 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9740	0.9498	0.9042	0.8042	0.6536	0.4643	0.3153	0.3619	0.6143	0.8613	0.9545	0.9784 (94)
Useful gains	691.6864	850.5612	970.8321	1029.2616	926.8333	657.5047	426.0527	445.9221	668.3357	764.2685	697.2004	652.4770 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1917.6781	1870.3096	1703.0105	1407.9693	1073.5105	689.1630	432.1102	455.5547	750.9293	1163.6285	1549.6963	1882.0924 (97)
Space heating kWh	912.1379	685.2709	544.7407	272.6696	109.1278	0.0000	0.0000	0.0000	0.0000	297.1238	613.7971	914.8338 (98a)
Space heating requirement - total per year (kWh/year)												4349.7015
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	912.1379	685.2709	544.7407	272.6696	109.1278	0.0000	0.0000	0.0000	0.0000	297.1238	613.7971	914.8338 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4349.7015
Space heating per m2										(98c) / (4) =		59.1635 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	912.1379	685.2709	544.7407	272.6696	109.1278	0.0000	0.0000	0.0000	0.0000	297.1238	613.7971	914.8338 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	912.1379	685.2709	544.7407	272.6696	109.1278	0.0000	0.0000	0.0000	0.0000	297.1238	613.7971	914.8338 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	233.4410	206.1846	218.4796	195.5153	188.8951	165.6683	157.4293	171.4785	172.2173	195.6809	209.9541	232.8336 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	233.4410	206.1846	218.4796	195.5153	188.8951	165.6683	157.4293	171.4785	172.2173	195.6809	209.9541	232.8336 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	35.7451	28.6760	25.8196	18.9165	14.6117	11.9379	13.3293	17.3259	22.5046	29.5273	33.3510	36.7385 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-45.1171	-74.3704	-123.5364	-148.2844	-156.3748	-132.4928	-129.2007	-120.7557	-101.0336	-86.7143	-52.0335	-37.4659 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-9.6560	-25.5301	-66.8661	-132.4926	-209.9349	-234.9239	-230.3366	-180.9466	-117.2309	-46.7272	-14.6673	-7.1705 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												4349.7015 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												2347.7776 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												288.4833 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2483.8622 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												4543.1002 (238)

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----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4349.7015	0.1557	677.2739 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2347.7776	0.1411	331.1991 (264)
Space and water heating			1008.4730 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	288.4833	0.1443	41.6371 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1207.3796	0.1340	-161.8489
PV Unit electricity exported	-1276.4826	0.1190	-151.9539
Total			-313.8027 (269)
Total CO2, kg/year			741.9945 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.0900 (273)

----- 13a. Primary energy - Individual heating systems including micro-CHP -----

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4349.7015	1.5764	6857.0558 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2347.7776	1.5216	3572.4490 (278)
Space and water heating			10429.5048 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	288.4833	1.5338	442.4853 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1207.3796	1.4954	-1805.5615
PV Unit electricity exported	-1276.4826	0.4365	-557.2296
Total			-2362.7911 (283)
Total Primary energy kWh/year			8571.2238 (286)
Dwelling Primary energy Rate (DPER)			116.5800 (287)

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Plot Reference	24396-3				Issued on Date	17/04/2026	
Assessment Reference	Renewable			Plot Type Ref	EST		
Plot Address	Flat 3, 1, Lakefield Road, London, N22 6RR				SAP Version	10.2	
SAP Rating	56 D	DER	9.52	TER			
Environmental	91 B	% DER < TER				N/A	
CO ₂ Emissions (t/year)	0.79	DFEE	62.73	TFEE			
Compliance Check	N/A	% DFEE < TFEE					
% DPER < TPER		DPER	106.40	TPER			
Assessor Details	Mr. Samuel Marks				Assessor ID	BP82-0001	
Client	24396, Ibi Ekinah						

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	2.4200 (1b)	x 2.5000 (2b)	= 6.0500 (1b) - (3b)
First floor	73.0400 (1c)	x 2.3500 (2c)	= 171.6440 (1c) - (3c)
Second floor	32.5200 (1d)	x 2.0300 (2d)	= 66.0156 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	107.9800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	243.7096 (5)

2. Ventilation rate

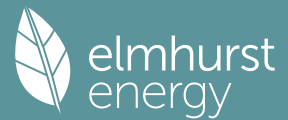
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1641 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9141 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7085 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9033	0.8856	0.8679	0.7793	0.7616	0.6730	0.6730	0.6553	0.7085	0.7616	0.7970	0.8324 (22b)
Effective ac	0.9080	0.8921	0.8766	0.8037	0.7900	0.7265	0.7265	0.7147	0.7510	0.7900	0.8176	0.8465 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			20.7400	1.1450	23.7481		(27)
Roof Light			3.5300	1.1450	4.0420		(27a)
Floor over Hall			6.2700	0.1505	0.9435	20.0000	125.4000 (28b)
ifloor			27.1000	0.1200	3.2520	110.0000	2981.0000 (28a)
xWall	43.1400	11.7000	31.4400	0.3000	9.4320	9.0000	282.9600 (29a)
pWall	33.9500	7.8400	26.1100	0.1800	4.6998	110.0000	2872.1001 (29a)
Wall to Hall	11.0300		11.0300	0.1300	1.4339	9.0000	99.2700 (29a)
Dormer Wall	8.5800	1.2000	7.3800	0.1500	1.1070	9.0000	66.4200 (29a)
Roof Void Studs	28.3900		28.3900	0.1400	3.9746	9.0000	255.5100 (29a)
Flat	7.1900		7.1900	0.1500	1.0785	9.0000	64.7100 (30)
Plane	4.5500		4.5500	0.1100	0.5005	9.0000	40.9500 (30)
Sloped	35.0600	3.5300	31.5300	0.1500	4.7295	9.0000	283.7700 (30)
shPlane	30.6900		30.6900	0.1043	3.1999	9.0000	276.2100 (30)
Total net area of external elements Aum (A, m ²)			235.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		62.1413		(33)
Main dwelling							
Party Wall			45.0600	0.0000	0.0000	70.0000	3154.2001 (32)
Party Floor			64.3500			30.0000	1930.5000 (32d)

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Party Ceiling	40.2000	20.0000	804.0000 (32b)
B	30.6400	100.0000	3063.9999 (32c)
T1	132.4000	9.0000	1191.5999 (32c)
T2	17.1700	9.0000	154.5300 (32c)
Internal Floor	34.9400	18.0000	628.9200 (32d)
Internal Ceiling	34.9400	9.0000	314.4600 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Default value 0.200 * total exposed area)
Point Thermal Bridges
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) = 18590.5101 (34)
172.1662 (35)
47.1900 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 109.3313 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	73.0213	71.7473	70.4985	64.6329	63.5355	58.4268	58.4268	57.4808	60.3946	63.5355	65.7556	68.0766	(38)
Heat transfer coeff	182.3526	181.0786	179.8298	173.9642	172.8668	167.7581	167.7581	166.8120	169.7259	172.8668	175.0869	177.4079	(39)
Average = Sum(39)m / 12 =												173.9590	
HLP	1.6888	1.6770	1.6654	1.6111	1.6009	1.5536	1.5536	1.5448	1.5718	1.6009	1.6215	1.6430	(40)
HLP (average)												1.6110	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8021 (42)
Hot water usage for mixer showers	78.0790	76.8836	75.1220	72.4119	69.9838	66.5868	63.9001	67.0411	68.6208	71.9854	75.4892	78.0086	(42a)
Hot water usage for baths	30.0573	29.6036	28.9581	27.9914	27.1203	25.9210	25.0112	26.1237	26.7076	27.8959	29.1314	30.0335	(42b)
Hot water usage for other uses	43.3267	41.7512	40.1757	38.6002	37.0247	35.4491	35.4491	37.0247	38.6002	40.1757	41.7512	43.3267	(42c)
Average daily hot water use (litres/day)												139.2410	(43)
Daily hot water use	151.4631	148.2384	144.2558	139.0035	134.1287	127.9570	124.3604	130.1895	133.9287	140.0570	146.3718	151.3688	(44)
Energy conte	222.9798	196.1494	206.1385	181.5734	172.8384	147.9780	137.4219	153.2354	155.3505	180.4776	197.8264	222.2962	(45)
Energy content (annual)										Total = Sum(45)m =		2174.2655	
Distribution loss (46)m = 0.15 x (45)m	33.4470	29.4224	30.9208	27.2360	25.9258	22.1967	20.6133	22.9853	23.3026	27.0716	29.6740	33.3444	(46)
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.1400	(55)
Total storage loss	35.3400	31.9200	35.3400	34.2000	35.3400	34.2000	35.3400	35.3400	34.2000	35.3400	34.2000	35.3400	(56)
If cylinder contains dedicated solar storage	35.3400	31.9200	35.3400	34.2000	35.3400	34.2000	35.3400	35.3400	34.2000	35.3400	34.2000	35.3400	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	258.3198	228.0694	241.4785	215.7734	208.1784	182.1780	172.7619	188.5754	189.5505	215.8176	232.0264	257.6362	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	258.3198	228.0694	241.4785	215.7734	208.1784	182.1780	172.7619	188.5754	189.5505	215.8176	232.0264	257.6362	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2590.3655	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	102.4128	90.7557	96.8131	87.7331	85.7408	76.5627	73.9648	79.2228	79.0141	88.2808	93.1373	102.1855	(65)

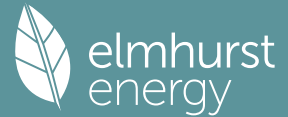
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	140.1071	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	135.4886	150.0052	135.4886	140.0049	135.4886	140.0049	135.4886	135.4886	140.0049	135.4886	140.0049	135.4886	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.6212	271.4087	264.3844	249.4305	230.5540	212.8127	200.9604	198.1730	205.1972	220.1511	239.0277	256.7690	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	37.0107	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	-112.0857	(71)
Water heating gains (Table 5)	137.6516	135.0531	130.1251	121.8516	115.2430	106.3371	99.4150	106.4822	109.7417	118.6570	129.3573	137.3461	(72)
Total internal gains	609.7935	624.4991	598.0302	579.3191	549.3177	524.1867	500.8961	505.1759	519.9760	542.3288	576.4220	597.6357	(73)

6. Solar gains

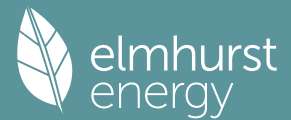
[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.1000	10.6334	0.6300	0.7000	0.7700	3.5747 (74)
Southeast	3.2500	36.7938	0.6300	0.7000	0.7700	36.5452 (77)
Southwest	6.1400	36.7938	0.6300	0.7000	0.7700	69.0423 (79)
West	1.1000	19.6403	0.6300	0.7000	0.7700	6.6026 (80)
Northwest	9.1500	11.2829	0.6300	0.7000	0.7700	31.5512 (81)
Southwest	0.8800	37.0308	0.6300	0.7000	1.0000	12.9338 (82)

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Northwest		2.6500			18.0708			0.6300		0.7000		1.0000		19.0066 (82)	
Solar gains	179.2563	328.3021	508.4455	726.4491	899.6663	930.4308	881.5649	747.0033	583.2912	378.9871	218.9317	150.6500	(83)		
Total gains	789.0499	952.8012	1106.4757	1305.7682	1448.9840	1454.6175	1382.4610	1252.1792	1103.2672	921.3159	795.3536	748.2857	(84)		
7. Mean internal temperature (heating season)															
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)			
Utilisation factor for gains for living area, nil,m (see Table 9a)															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
tau	28.3189	28.5182	28.7162	29.6844	29.8729	30.7826	30.7826	30.9572	30.4257	29.8729	29.4941	29.1082			
alpha	2.8879	2.9012	2.9144	2.9790	2.9915	3.0522	3.0522	3.0638	3.0284	2.9915	2.9663	2.9405			
util living area															
	0.9849	0.9734	0.9510	0.8924	0.7870	0.6300	0.4941	0.5515	0.7737	0.9291	0.9753	0.9871	(86)		
MIT	18.3572	18.6779	19.1787	19.8865	20.4450	20.8114	20.9340	20.9077	20.6206	19.8816	19.0399	18.3620	(87)		
Th 2	19.5489	19.5574	19.5657	19.6052	19.6127	19.6475	19.6475	19.6540	19.6341	19.6127	19.5976	19.5820	(88)		
util rest of house															
	0.9810	0.9666	0.9378	0.8628	0.7275	0.5296	0.3584	0.4139	0.6884	0.9032	0.9678	0.9837	(89)		
MIT 2	17.2108	17.5328	18.0294	18.7335	19.2401	19.5559	19.6286	19.6245	19.4192	18.7507	17.9208	17.2371	(90)		
Living area fraction															
	17.5253	17.8469	18.3446	19.0498	19.5706	19.9003	19.9867	19.9765	fLA = Living area / (4) =	19.7488	19.0610	18.2278	0.2743 (91)		
MIT													17.5457 (92)		
Temperature adjustment													-0.1500		
adjusted MIT	17.3753	17.6969	18.1946	18.8998	19.4206	19.7503	19.8367	19.8265	19.5988	18.9110	18.0778	17.3957	(93)		
8. Space heating requirement															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.9722	0.9539	0.9207	0.8441	0.7179	0.5380	0.3787	0.4331	0.6858	0.8856	0.9559	0.9760	(94)		
Useful gains	767.0936	908.8495	1018.6920	1102.2086	1040.1958	782.5976	523.5165	542.2643	756.6113	815.9418	760.2600	730.2919	(95)		
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)		
Heat loss rate W															
	2384.3121	2317.2442	2103.0457	1739.6074	1334.6402	864.0004	542.9849	571.5812	933.2827	1436.6876	1922.0617	2341.0135	(97)		
Space heating kWh															
	1203.2105	946.4412	806.7592	458.9271	219.0667	0.0000	0.0000	0.0000	0.0000	461.8349	836.4972	1198.3768	(98a)		
Space heating requirement - total per year (kWh/year)												6131.1137			
Solar heating kWh															
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)		
Solar heating contribution - total per year (kWh/year)												0.0000			
Space heating kWh															
	1203.2105	946.4412	806.7592	458.9271	219.0667	0.0000	0.0000	0.0000	0.0000	461.8349	836.4972	1198.3768	(98c)		
Space heating requirement after solar contribution - total per year (kWh/year)												6131.1137			
Space heating per m2										(98c) / (4) =		56.7801	(99)		
9a. Energy requirements - Individual heating systems, including micro-CHP															
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)			
Fraction of space heat from main system(s)												1.0000 (202)			
Efficiency of main space heating system 1 (in %)												100.0000 (206)			
Efficiency of main space heating system 2 (in %)												0.0000 (207)			
Efficiency of secondary/supplementary heating system, %												0.0000 (208)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Space heating requirement															
	1203.2105	946.4412	806.7592	458.9271	219.0667	0.0000	0.0000	0.0000	0.0000	461.8349	836.4972	1198.3768	(98)		
Space heating efficiency (main heating system 1)															
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)		
Space heating fuel (main heating system)															
	1203.2105	946.4412	806.7592	458.9271	219.0667	0.0000	0.0000	0.0000	0.0000	461.8349	836.4972	1198.3768	(211)		
Space heating efficiency (main heating system 2)															
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)		
Space heating fuel (main heating system 2)															
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)		
Space heating fuel (secondary)															
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)		
Water heating															
Water heating requirement															
	258.3198	228.0694	241.4785	215.7734	208.1784	182.1780	172.7619	188.5754	189.5505	215.8176	232.0264	257.6362	(64)		
Efficiency of water heater															
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)		
Fuel for water heating, kWh/month															
	258.3198	228.0694	241.4785	215.7734	208.1784	182.1780	172.7619	188.5754	189.5505	215.8176	232.0264	257.6362	(219)		
Space cooling fuel requirement															
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)		
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)		
Lighting	37.6959	30.2410	27.2287	19.9489	15.4091	12.5894	14.0567	18.2714	23.7328	31.1387	35.1711	38.7435	(232)		
Electricity generated by PVs (Appendix M) (negative quantity)															
(233a)m	-58.0267	-91.0189	-143.7126	-168.7929	-177.6279	-143.9448	-140.8264	-132.3984	-113.5665	-104.6367	-65.9320	-48.9900	(233a)		
Electricity generated by wind turbines (Appendix M) (negative quantity)															
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)		
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)															
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)		
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)															
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)		
Electricity generated by PVs (Appendix M) (negative quantity)															
(233b)m	-12.5037	-29.8914	-69.3609	-124.8752	-190.5381	-219.8021	-217.3916	-177.3256	-123.5874	-52.0103	-18.3944	-9.5634	(233b)		
Electricity generated by wind turbines (Appendix M) (negative quantity)															
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)		
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)															
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)		
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)															
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)		
Annual totals kWh/year															
Space heating fuel - main system 1												6131.1137	(211)		
Space heating fuel - main system 2												0.0000	(213)		
Space heating fuel - secondary												0.0000	(215)		
Efficiency of water heater												100.0000			
Water heating fuel used												2590.3655	(219)		
Space cooling fuel												0.0000	(221)		

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Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
Total electricity for the above, kWh/year	41.0000 (231)
Electricity for lighting (calculated in Appendix L)	304.2272 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2634.7180 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	6431.9884 (238)

----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6131.1137	0.1549	949.9875 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2590.3655	0.1411	365.5440 (264)
Space and water heating			1315.5315 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	304.2272	0.1443	43.9094 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1389.4738	0.1348	-187.3542
PV Unit electricity exported	-1245.2442	0.1201	-149.5086
Total			-336.8628 (269)
Total CO2, kg/year			1028.2653 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.5200 (273)

----- 13a. Primary energy - Individual heating systems including micro-CHP -----

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	6131.1137	1.5736	9648.1919 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2590.3655	1.5218	3942.0396 (278)
Space and water heating			13590.2315 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	304.2272	1.5338	466.6338 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1389.4738	1.4984	-2081.9811
PV Unit electricity exported	-1245.2442	0.4403	-548.2778
Total			-2630.2589 (283)
Total Primary energy kWh/year			11488.6312 (286)
Dwelling Primary energy Rate (DPER)			106.4000 (287)