



27 Aylmer Road
London N2 0BS

Energy Statement for Planning

Client:
Mr S Sinha
27 Aylmer Road
London
N2 0BS

Architect:
Chassay Studio
108 Palace Gardens Terrace
London
W8 4RT

Doc Ref: 253-GMS-RP-100v.2
September 2022

INTRODUCTION

The energy statement has been prepared in support of the planning application for the construction of a new 3 storey residential property in North London. The property replaces an existing residential property on the site with a new energy strategy which compliments planning requirements and embraces the requirements for energy conservation and sustainability.

National Planning Policy Framework

The NPPF has been updated and meeting the challenge of climate change and has been the focus of the policy update for new developments. It suggests that new development should focus on the mitigation of emissions through orientation & design and increase the use of renewable and low carbon technologies

London Plan 2021

The London plan 2021 makes no specific reference to single residential schemes and concentrates on major developments which should be zero carbon.

Local Planning

Haringey Councils Development plan, Policy SP4 has been replaced with the governments technical housing standards and this standard has been applied to the development of this project.

Aside from SP4 there are additional policies which shall be followed

Policy DM21

Policy DM21 requires that proposals should apply the energy hierarchy to minimise energy use in order to meet, and if possible, exceed, minimum carbon dioxide reduction requirements. Proposals should also apply the cooling hierarchy to reduce the potential for overheating and limit reliance on mechanical air conditioning systems.

Policy DM22

Policy DM22 supports proposals that contribute to the provision of decentralised energy networks and states that new development should have the ability to connect to DE networks, where reasonably possible. All minor new-build development located within 25 metres of a DE network 'connection zone' should be designed for connection to a DE (Decentralised Energy) network.

This report sets out that the development will meet the current Building Regulations for energy efficiency as a baseline and include the use of low carbon and renewable energy technology to offset the energy demand even further. A detailed design SAP calculation has been produced and has set the energy savings that can be achieved from maximising the potential of the building fabric and using suitable technologies.

EXISTING AND PROPOSED DEVELOPMENT

The proposal is for the development of a new residential property on the located on the southern side of Aylmer Road with the main frontage facing in northerly direction.

The current house is constructed in the optimum orientation for energy reduction which will assist in the installation of renewable energy solutions.

Access to the property is from Aylmer Road



Fig 1: Site Plan

SAP 2012 and Building Regulations 2022

The Standard Assessment Procedure (SAP) 2012 is the UK government methodology for assessing and calculating the energy performance of residential dwellings.

This considers the many factors which make up the construction of a dwelling and includes the following:

- The construction materials making up the building U-Values (thermal insulation)
- Ventilation systems
- Fuel used for space heating
- Efficiency of controls systems
- Heat recovery systems
- Lighting
- Application of renewables

In addition to the SAP the Approved Document Part L which forms part of the Building Regulations documentation references the conservation of fuel and power and is divided into four separate documents.

- Part L1A – Newly constructed Dwellings
- Part L1B - Existing Dwellings
- Part L2A – Newly constructed non-Dwellings
- Part L2B – Existing non-Dwellings

Part L1A is the reference document which will be used in the detailed design of the property and sets out the energy efficiency required as calculated using the SAP methodology.

A detailed SAP calculation has been completed setting out the compliance with the AD Part L1A and show the achieved Dwelling Emission Rate (DER) under the Target Emission Rate (TER).

The results show that there is a 70% improvement in the Dwelling Emission Rate over the Target Emission Rate.

ENERGY PLAN

By adopting a sustainable approach to the design, construction, and operation of the house it follows the widely known and accepted base principles adopted within all councils for sustainable & energy efficient design. The three main environmental statements of **Be Lean**, **Be Clean** & **Be Green** and each has been applied throughout the design process so far to reduce the overall carbon footprint of the house through minimising the energy absorbed within the general operation.

Be Lean

During this planning process the redevelopment of the house considers the orientation of the building to maximise the use of natural resources available and reduce the amount of CO₂ being generated. These principles will use passive and active measures to minimise heat loss and air infiltration through the building fabric.

The architect has designed the house to maximise the use of natural daylight with portions of glazing used on the south elevation to bring the light into the living spaces. This maximisation allows the house to benefit from the winter sun which will passively support the heating system and to assist in heating the space during the winter months. This will reduce the demand for a mechanical heating system and utilise a glazing system to the maximised area available. The glazing will be of the highest specification possible to meet the budget and will meet the requirements of Building Regulations using a U-Value of 1.2W/m²K.

The principal rooms that will be most intensively used in daylight hours are located on the south side of the house to get the most benefit from the warmth from southerly sunshine. Conversely, rooms that will be less intensively used in daylight hours, including the integrated garage, cycle store, bathrooms and shower rooms are located on the north side of the house.

In addition to the maximising of the daylight itself the building fabric is proposed to also meet the requirements of Building Regulations minimum U-values for the walls, roof, and floor using high levels of insulation. Consideration of the materials being used has been given to select those with a low environmental impact over the full life cycle of the building. These materials for the main structure and finishing elements shall be responsibly sourced wherever feasible and it is the intent to select suppliers who can provide an environmental management system (EMS) certificate.

The building shall also take into consideration the required air tightness of the building and the required levels as noted within Building regulations. The aim of the project is to exceed these requirements to further improve energy efficiency.

Be Clean

Due to current legislation the use of fossil fuels has been acknowledged by government as significantly contributing to the global warming effect of the planet and having a detrimental effect on the environment. As such the government has taken steps to ensure that the reliance on such fossil fuels is

considered during planning process and alternative solutions sought out to reduce this reliance and therefore impact into the global warming effect.

The prime uses of fossil fuels such as Gas & Oil are used for the general heating and cooking facilities within the house using gas cooking or gas boilers for hot water and heating. As these items are generating most of the CO₂ emissions alternative solutions have been considered.

The use of electricity as a fuel has recently been significantly de-carbonised using alternative energy systems such as nuclear, wind, hydro electric or solar photovoltaic power.

Therefore, avoiding the use of fossil fuels can be achieved using electrically operated heat pumps systems in lieu of conventional combustion boilers which either use the heat stored within the mass of the earth/ground or by using air.

The project envisages using an Air to Water heat pump rated at 14kW and as provided by a mainstream Heat Pump manufacturer such as Mitsubishi, Daikin or Samsung.

Supplementing the heating system within the house is the need to ensure the building is of a sufficient air tightness to minimise the air infiltration and therefore heat loss. The building will be designed to an air tightness of 5m³/(h.m²)@50Pa or better through robust detailing of the construction.

To achieve good air quality within the house it is proposed to use a mixture of systems which include Mechanical Ventilation with Heat Recovery (MVHR) and Positive Input Ventilation (PIV). These systems have been proposed to respond to the architectural make up of the space and are independent of each other. They provide fresh air into the main space within the house and will remove any pollutants and therefore reducing the risks associated with health issues stemming from poor ventilation.

The house will utilise an MVHR system with an overall efficiency of 88% or better as noted in the SAP calculations. The units will be provided by industry known manufacturers such as Nuaire, Titon or Vent Axia.

Be Green

Once the building has been optimised in terms of orientation and construction, and the systems employed are as efficient as possible, the addition of renewable 'Green' energy is then considered to further reduce the reliance on 'grid' energy. Diverse options that have been considered include PV's, Solar thermal, Wind and GSHP.

Due to the location of the property being within a built-up area the use of wind turbines was not deemed to be an appropriate solution and therefore discounted.

The use of solar thermal panels has been considered in relation to heating the domestic hot water but with the prospect of maximising the use of solar electric panels discounted on terms of practicality.

GSHP was being considered however the area is not available to meet the demand using 'Slinky' pipework installed below ground level. The use of boreholes was technically viable but on cost grounds discounted as being excessive and outside the client's budget.

The best solution which meets the budget, and offers a practical installation is to install an array of Photovoltaic panels on the main house roof. The rear slope of the pitched roof faces almost due south offering the perfect orientation for the proposed array of PV panels to capture the energy from incident sunlight.

It is calculated that the PV panel array will provide at least 7.2kWp of energy to reduce the overall demand on the electrical infrastructure. If possible, the array will be enlarged if space is available.

It is also proposed to install rainwater harvesting using rain butts to aid with the watering of the gardens as required. These units will be placed in line with the main downpipes connected to the system.

Planning policy requires consideration for the property to have a connection to a future de-centralised heat network. In reviewing the London Heat map there doesn't appear to be any local energy distribution within the area or close to the property and it would be impractical to make provision at this stage.

SUMMARY

As stated previously the detailed design of the project at 27 Aylmer Road will meet or exceed the requirements of Building Regulations and general planning policy through the coherent and sensible design of the building.

The building has been modelled using proprietary energy software to produce a compliant scheme which demonstrates a PEA (Predicted Energy Assessment) giving an Energy Efficiency Rating of B and an Environmental impact (CO²) rating of A.

Low Carbon technology is being used where practicable and the main heating source will be an Air source heat pump.

On site renewable energy will be provided through PV panels providing 7.2kWp with additional battery storage as option to improve the energy efficiency.

To meet the aspirations of the client the building shall adopt a low energy approach and first meet the 'Be Lean' criteria through low building fabric u-values and the use of advanced heating controls.

27 Aylmer Rd
London



Predicted Energy Assessment



27 Aylmer Road, London

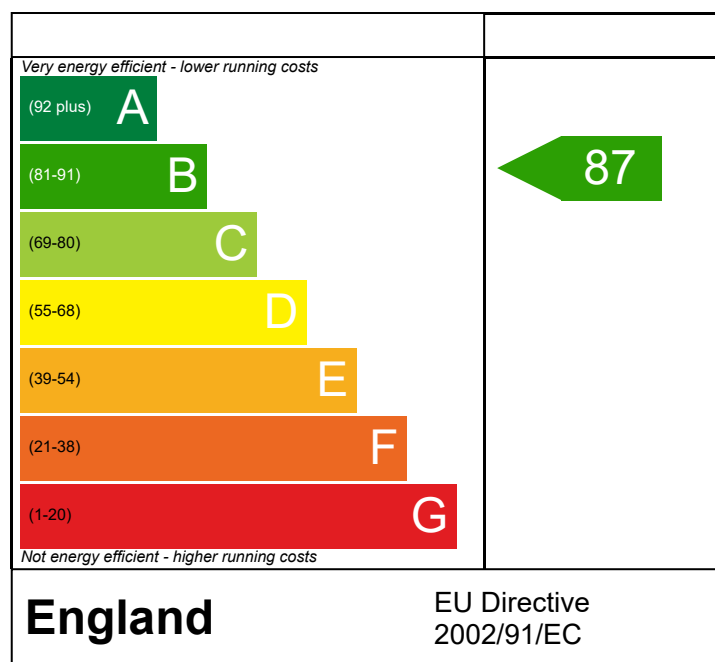
Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Detached
16/08/2023
Peter Kinsella
803 m²
1012-6886-7943

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

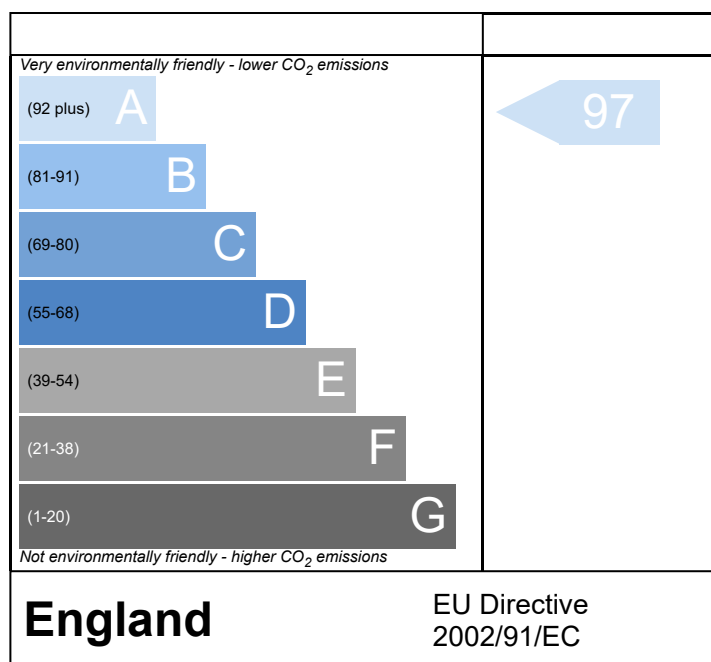
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Summary for Input Data



Property Reference	10294 1	Issued on Date	16/08/2023
Assessment Reference	v0	Prop Type Ref	Detached house
Property	27 Aylmer Road, London		

SAP Rating	87 B	DER	2.05	TER	6.90
Environmental	97 A	% DER < TER			70.29
CO ₂ Emissions (t/year)	1.32	DFEE	37.14	TFEE	37.74
Compliance Check	See BREL	% DFEE < TFEE			1.59
% DPER < TPER	35.34	DPER	23.73	TPER	36.70

Assessor Details	Mr. Peter Kinsella	Assessor ID	L770-0002
Client	GMS , Mark Smith		

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	North
Property Tenture	ND
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	4
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation

7.0 Electricity Tariff	Standard
Smart electricity meter fitted	No
Smart gas meter fitted	No

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	68.00 m	234.00 m ²	2.65 m
1st Storey:	68.00 m	234.00 m ²	3.00 m
2nd Storey:	68.00 m	234.00 m ²	3.10 m
3rd Storey:	49.00 m	101.00 m ²	2.50 m

8.0 Living Area	28.00	m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	External Wall 1	Cavity Wall	Cavity wall : plasterboard on dabs, dense block, filled cavity, any outside structure	0.18	150.00	440.00	309.92	0.00	None	130.08	Enter Gross Area
	Basement wall retaining	Cavity Wall	Cavity wall : plasterboard on dabs, dense block, filled cavity, any outside structure	0.18	150.00	52.70	52.70	0.00	None	0.00	Enter Gross Area
	Garage wall	Cavity Wall	Cavity wall : plasterboard on dabs, dense block, filled cavity, any outside structure	0.18	150.00	32.35	32.35	0.00	None	0.00	Enter Gross Area
	Stud wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.20	9.00	40.00	40.00	0.00	None	0.00	Enter Gross Area
	Dormer wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.20	9.00	47.00	42.38	0.00	None	4.62	Enter Gross Area

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	Pitched roof	External Slope	Plasterboard, insulated slope	0.11	9.00	67.20	4.22	None	0.00	Enter Gross Area	4.22
	Flat roof	External Flat	Plasterboard, insulated flat roof	0.11	9.00	38.95	0.00	None	0.00	Enter Gross Area	0.00
	Ceiling voids	External Plane	Plasterboard, insulated at ceiling level	0.11	9.00	133.00	0.00	None	0.00	Enter Gross Area	0.00
	Flat roof terrace	External Flat	Plasterboard, insulated flat roof	0.11	9.00	40.00	0.00	None	0.00	Enter Gross Area	0.00
	bay	External Flat	Plasterboard, insulated flat roof	0.11	9.00	2.16	0.00	None	0.00	Enter Gross Area	0.00
	Dormer roof	External Flat	Plasterboard, insulated flat roof	0.11	9.00	18.40	0.00	None	0.00	Enter Gross Area	0.00

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
	Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.13	None	0.00	75.00	234.00

Summary for Input Data

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Front door	Manufacturer	Solid Door							1.10
Windows	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.05			0.50			1.20
Roof lights	Manufacturer	Roof Light	Double Low-E Soft 0.05			0.63		0.70	1.70
Sliders	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
D1	Front door	External Wall 1	North	2.21	
W2 basement	Windows	External Wall 1	East	1.30	
W3 basement	Windows	External Wall 1	East	1.90	
W4 basement	Windows	External Wall 1	East	1.90	
W5 basement	Windows	External Wall 1	East	4.90	
W6 basement	Windows	External Wall 1	East	4.90	
W7 basement	Windows	External Wall 1	South	3.40	
W8 basement	Windows	External Wall 1	West	1.90	
W9 basement	Windows	External Wall 1	West	1.90	
W10 basement	Windows	External Wall 1	South	1.90	
W11 basement	Windows	External Wall 1	South	4.60	
W12 basement	Windows	External Wall 1	West	1.90	
W13 basement	Windows	External Wall 1	West	1.90	
W14 basement	Windows	External Wall 1	West	3.30	
W15 basement	Windows	External Wall 1	West	1.20	
W16 GF	Windows	External Wall 1	North	1.23	
W17 GF	Windows	External Wall 1	East	0.60	
W18 GF	Windows	External Wall 1	North	1.80	
W19 GF	Windows	External Wall 1	North	4.00	
W20 GF	Windows	External Wall 1	North	1.80	
W21 GF	Windows	External Wall 1	West	0.60	
W22 GF	Windows	External Wall 1	West	2.00	
W23 GF	Windows	External Wall 1	West	1.14	
W24 GF	Windows	External Wall 1	South	4.37	
W25 GF	Windows	External Wall 1	South	1.61	
W26 GF slider	Sliders	External Wall 1	West	8.10	
W27 GF slider	Sliders	External Wall 1	South	23.49	
W28 GF	Windows	External Wall 1	East	1.40	
W29 GF	Windows	External Wall 1	East	4.80	
W30 GF FF SF front	Windows	External Wall 1	North	4.25	
W31 FF	Windows	External Wall 1	North	2.40	
W32 FF	Windows	External Wall 1	North	1.20	
W33 FF	Windows	External Wall 1	North	1.32	
W34 FF	Windows	External Wall 1	North	1.15	
W35 FF	Windows	External Wall 1	North	3.30	
W36 FF	Windows	External Wall 1	North	1.15	
W37 FF	Windows	External Wall 1	West	0.91	
W38 FF	Windows	External Wall 1	West	0.91	
W39 FF rear	Windows	External Wall 1	South	2.56	
W39 FF rear	Windows	External Wall 1	South	1.36	
W40 - 44 FF rear	Windows	External Wall 1	South	4.28	
W45 FF rear doors	Windows	External Wall 1	South	2.18	
W46 FF rear doors	Windows	External Wall 1	South	5.98	
W47 FF	Windows	External Wall 1	West	1.07	
W48 49 dormers	Windows	Dormer wall	North	3.08	
W50 -52 dormers	Windows	Dormer wall	South	1.54	
V53	Roof lights	Pitched roof	North	1.10	45
V54	Roof lights	Pitched roof	North	0.88	45
V55	Roof lights	Pitched roof	West	1.12	45
V56	Roof lights	Pitched roof	East	1.12	45

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E1 Steel lintel with perforated steel base plate	Non Gov Approved Schemes	65.65	0.05	0.05 tbc	Yes
E3 Sill	Independently assessed	64.75	0.05	0.05 tbc	Yes
E4 Jamb	Gov Approved Scheme	199.30	0.05	0.05 tbc	Yes
E5 Ground floor (normal)	Non Gov Approved Schemes	68.00	0.05	0.05 tbc	Yes
E6 Intermediate floor within a dwelling	Non Gov Approved Schemes	185.00	0.05	0.05 tbc	No
E16 Corner (normal)	Non Gov Approved Schemes	60.00	0.05	0.05 tbc	No
R11 Upstands or kerbs of rooflights	Table K1 - Default	16.80	0.24	0.24	Yes
E16 Corner (normal)	Non Gov Approved Schemes	28.80	0.05	0.05 tbc timber	No
E14 Flat roof	Table K1 - Default	19.80	0.16	0.16 tbc	No
R4 Ridge (vaulted ceiling)	Non Gov Approved Schemes	12.00	0.05	0.05 tbc	No
E14 Flat roof	Table K1 - Default	27.20	0.16	0.16 Main flat roof	No
E11 Eaves (insulation at rafter level)	Non Gov Approved Schemes	33.00	0.00	0.00 tbc to roof void	No
E14 Flat roof	Table K1 - Default	30.00	0.16	0.16 dormers	No
R8 Roof to wall (rafter)	Table K1 - Default	33.00	0.12	0.12	No

Summary for Input Data



E17 Corner (inverted – internal area greater than external area) Non Gov Approved Schemes 41.90 0.00 0.00 No

Y-value 0.00 W/m²K

18.0 Pressure Testing

Yes
Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa
Test Method Blower Door

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present Yes
Approved Installation No
Mechanical Ventilation data Type Database
Type Balanced mechanical ventilation with heat recovery
MV Reference Number 500167
Configuration 6
Manufacturer SFP 0.99
Duct Type Flexible
MVHR Efficiency 88.00
Wet Rooms 6
SFP from Installer Commissioning Certificate No
MVHR System Location Inside heated envelope (installed exclusively)
Duct Installation Specification Level 2

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

No

22.0 Lighting

No Fixed Lighting No

Name	Efficacy	Power	Capacity	Count
Lighting 1	95.00	6	570	10
Lighting 2	95.00	12	1140	2

24.0 Main Heating 1

Database
Percentage of Heat 100.00 %
Database Ref. No. 105068
Fuel Type Electricity
In Winter 0.00
In Summer 0.00
Model Name Ecodan 14.0 kW
Manufacturer Mitsubishi Electric Europe B.V.
System Type Heat Pump
Controls SAP Code 2207
Is MHS Pumped Pump in heated space
Heating Pump Age 2013 or later
Heat Emitter Underfloor
Underfloor Heating Yes - Pipes in thin screed
Flow Temperature Enter value
Flow Temperature Value 45.00

25.0 Main Heating 2

None

26.0 Heat Networks

None

28.0 Water Heating

Water Heating Main Heating 1

Summary for Input Data

SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	No
Cold Water Source	From mains
Bath Count	1
Immersion Only Heating Hot Water	No

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	300.00	L
Loss	1.89	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store

None

32.0 Photovoltaic Unit

0 Photovoltaic Unit	One Dwelling
Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
3.60	Horizontal	Horizontal	None Or Little		No	1.00		
3.60	South	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro

None

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

Lower cost measures

None

Further measures to achieve even higher standards

Typical Cost	Typical savings per year	Ratings after improvement	
		SAP rating	Environmental Impact
		B 87	A 98
		0	0
		0	0

Full SAP Calculation Printout



Property Reference	10294 1	Issued on Date	16/08/2023
Assessment Reference	v0	Prop Type Ref	Detached house
Property	27 Aylmer Road, London		
SAP Rating	87 B	DER	2.05
Environmental	97 A	TER	6.90
CO ₂ Emissions (t/year)	1.32	% DER < TER	70.29
Compliance Check	See BREL	DFEE	37.14
% DPER < TPER	35.34	TFEE	37.74
		% DFEE < TFEE	1.59
		DFEE	23.73
		TPER	36.70
Assessor Details	Mr. Peter Kinsella	Assessor ID	L770-0002
Client	GMS, Mark Smith		

SAP 10 WORKSHEET FOR New Build (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)
Ground floor	234.0000 (1b)	x 2.6500 (2b)	= 620.1000 (1b) -
First floor	234.0000 (1c)	x 3.0000 (2c)	= 702.0000 (1c) -
Second floor	234.0000 (1d)	x 3.1000 (2d)	= 725.4000 (1d) -
Third floor	101.0000 (1e)	x 2.5000 (2e)	= 252.5000 (1e) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	803.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 2300.0000 (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	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

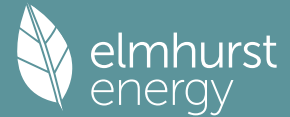
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test		0.0000 / (5) = 0.0000 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		5.0000 (17)
Number of sides sheltered		0.2500 (18)
		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												70.4000 (23c)
Effective ac	0.4189	0.4136	0.4083	0.3817	0.3764	0.3499	0.3499	0.3446	0.3605	0.3764	0.3871	0.3977 (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
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Front door			2.2100	1.1000	2.4310			(26)
Windows (Uw = 1.20)			100.9300	1.1450	115.5687			(27)
Sliders (Uw = 1.20)			31.5900	1.1450	36.1718			(27)
V53			1.1000	1.5918	1.7509			(27a)
V54			0.8800	1.5918	1.4007			(27a)
V55			1.1200	1.5918	1.7828			(27a)
V56			1.1200	1.5918	1.7828			(27a)
Heatloss Floor 1			234.0000	0.1300	30.4200	75.0000	17550.0000	(28a)
External Wall 1	440.0000	130.1100	309.8900	0.1800	55.7802	150.0000	46483.5000	(29a)
Basement wall retaining	52.7000		52.7000	0.1800	9.4860	150.0000	7905.0000	(29a)
Garage wall	32.3500		32.3500	0.1800	5.8230	150.0000	4852.5000	(29a)
Stud wall	40.0000		40.0000	0.2000	8.0000	9.0000	360.0000	(29a)
Dormer wall	47.0000	4.6200	42.3800	0.2000	8.4760	9.0000	381.4200	(29a)
Pitched roof	67.2000	4.2200	62.9800	0.1100	6.9278	9.0000	566.8200	(30)
Flat roof	38.9500		38.9500	0.1100	4.2845	9.0000	350.5500	(30)
Ceiling voids	133.0000		133.0000	0.1100	14.6300	9.0000	1197.0000	(30)
Flat roof terrace	40.0000		40.0000	0.1100	4.4000	9.0000	360.0000	(30)
bay	2.1600		2.1600	0.1100	0.2376	9.0000	19.4400	(30)
Dormer roof	18.4000		18.4000	0.1100	2.0240	9.0000	165.6000	(30)
Total net area of external elements Aum(A, m2)			1145.7600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	311.3778			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 80191.8300 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 99.8653 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	65.6500	0.0500	3.2825
E3 Sill	64.7500	0.0500	3.2375
E4 Jamb	199.3000	0.0500	9.9650
E5 Ground floor (normal)	68.0000	0.0500	3.4000
E6 Intermediate floor within a dwelling	185.0000	0.0500	9.2500
E16 Corner (normal)	60.0000	0.0500	3.0000
R11 Upstands or kerbs of rooflights	16.8000	0.2400	4.0320
E16 Corner (normal)	28.8000	0.0500	1.4400
E14 Flat roof	19.8000	0.1600	3.1680
R4 Ridge (vaulted ceiling)	12.0000	0.0500	0.6000
E14 Flat roof	27.2000	0.1600	4.3520
E11 Eaves (insulation at rafter level)	33.0000	0.0000	0.0000
E14 Flat roof	30.0000	0.1600	4.8000
R8 Roof to wall (rafter)	33.0000	0.1200	3.9600
E17 Corner (inverted - internal area greater than external area)	41.9000	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			54.4870 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 365.8648 (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	317.9736	313.9414	309.9092	289.7482	285.7161	265.5551	265.5551	261.5229	273.6195	285.7161	293.7804	301.8448	(38)
Heat transfer coeff	683.8383	679.8062	675.7740	655.6130	651.5808	631.4199	631.4199	627.3877	639.4843	651.5808	659.6452	667.7096	(39)
Average = Sum(39)m / 12 =												654.6050	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8516	0.8466	0.8416	0.8165	0.8114	0.7863	0.7863	0.7813	0.7964	0.8114	0.8215	0.8315	(40)
HLP (average)												0.8152	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.7858 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	106.5521	104.9696	102.7412	98.6324	95.5558	92.1443	90.3016	92.5144	94.9238	98.5742	102.7676	106.1919	(42b)
Hot water usage for other uses	56.2112	54.1672	52.1232	50.0791	48.0351	45.9910	45.9910	48.0351	50.0791	52.1232	54.1672	56.2112	(42c)
Average daily hot water use (litres/day)												149.8917	(43)
Daily hot water use	162.7633	159.1368	154.8644	148.7115	143.5909	138.1353	136.2926	140.5495	145.0029	150.6974	156.9348	162.4031	(44)
Energy conte	257.7773	226.6087	238.0208	203.5786	193.3009	169.8535	164.8341	174.0296	178.8031	204.4949	223.5824	254.2840	(45)
Energy content (annual)										Total = Sum(45)m =		2489.1680	(45)
Distribution loss (46)m = 0.15 x (45)m	38.6666	33.9913	35.7031	30.5368	28.9951	25.4780	24.7251	26.1044	26.8205	30.6742	33.5374	38.1426	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0206	(55)
Total storage loss	31.6386	28.5768	31.6386	30.6180	31.6386	30.6180	31.6386	31.6386	30.6180	31.6386	30.6180	31.6386	(56)
If cylinder contains dedicated solar storage													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	312.6783	276.1967	292.9218	256.7086	248.2019	222.9835	219.7351	228.9306	231.9331	259.3959	276.7124	309.1850	(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)

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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	312.6783	276.1967	292.9218	256.7086	248.2019	222.9835	219.7351	228.9306	231.9331	259.3959	276.7124	309.1850 (64)
Total per year (kWh/year) = Sum(64)m =												3135.5830 (64)
12Total per year (kWh/year)												3136 (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	129.6318	115.0178	123.0627	110.1939	108.1933	98.9803	98.7281	101.7857	101.9560	111.9154	116.8452	128.4702 (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	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	414.0538	458.4167	414.0538	427.8555	414.0538	427.8555	414.0538	414.0538	427.8555	414.0538	427.8555	414.0538	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	797.0830	805.3542	784.5110	740.1382	684.1256	631.4816	596.3122	588.0409	608.8842	653.2569	709.2696	761.9135	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	(71)
Water heating gains (Table 5)	174.2362	171.1574	165.4069	153.0471	145.4212	137.4726	132.6991	136.8087	141.6056	150.4239	162.2849	172.6751	(72)
Total internal gains	1465.1604	1514.7157	1443.7590	1400.8283	1323.3879	1276.5972	1222.8525	1218.6908	1258.1328	1297.5220	1379.1975	1428.4298	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	26.7000	10.6334	0.5000	0.0000	0.7700	109.3059 (74)
East	21.7000	19.6403	0.5000	0.0000	0.7700	164.0846 (76)
South	33.8000	46.7521	0.5000	0.0000	0.7700	608.3846 (78)
West	18.7300	19.6403	0.5000	0.0000	0.7700	141.6269 (80)
North	1.9800	15.2954	0.6300	0.7000	1.0000	12.0201 (82)
East	1.1200	25.9287	0.6300	0.7000	1.0000	11.5260 (82)
West	1.1200	25.9287	0.6300	0.7000	1.0000	11.5260 (82)
South	23.4900	46.7521	0.6300	0.7000	0.7700	335.6260 (78)
West	8.1000	19.6403	0.6300	0.7000	0.7700	48.6188 (80)

Solar gains	1442.7191	2516.5820	3583.9102	4649.6004	5379.3258	5410.6465	5187.5985	4635.8721	3953.6201	2820.8525	1739.2038	1227.2317 (83)
Total gains	2907.8795	4031.2977	5027.6693	6050.4287	6702.7137	6687.2437	6410.4510	5854.5629	5211.7529	4118.3745	3118.4013	2655.6615 (84)

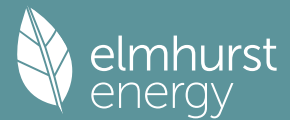
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, n1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.5742	32.7674	32.9630	33.9766	34.1869	35.2784	35.2784	35.5052	34.8336	34.1869	33.7689	33.3611	
alpha	3.1716	3.1845	3.1975	3.2651	3.2791	3.3519	3.3519	3.3670	3.3222	3.2791	3.2513	3.2241	
util living area	0.9902	0.9733	0.9386	0.8570	0.7263	0.5545	0.4181	0.4687	0.7011	0.9131	0.9800	0.9927 (86)	
Living	19.0872	19.4077	19.8196	20.3135	20.6488	20.8356	20.8868	20.8776	20.7426	20.2548	19.5903	19.0658	
Non living	17.9008	18.3120	18.8357	19.4635	19.8637	20.0862	20.1336	20.1312	19.9871	19.4053	18.5623	17.8854	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	19	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	12	28	26	0	0	0	0	0	0	0	0	31	
MIT	20.5806	20.0982	20.2489	20.3135	20.6488	20.8356	20.8868	20.8776	20.7426	20.2548	19.5903	19.9045 (87)	
Th 2	20.2088	20.2131	20.2175	20.2391	20.2434	20.2652	20.2652	20.2696	20.2565	20.2434	20.2348	20.2261 (88)	
util rest of house	0.9888	0.9696	0.9299	0.8375	0.6909	0.5022	0.3533	0.4019	0.6518	0.8969	0.9766	0.9916 (89)	
MIT 2	19.8145	19.3740	19.4831	19.4635	19.8637	20.0862	20.1336	20.1312	19.9871	19.4053	18.5623	19.1930 (90)	
Living area fraction	fLA = Living area / (4) =												0.0349 (91)
MIT	19.8412	19.3993	19.5098	19.4931	19.8910	20.1123	20.1599	20.1573	20.0135	19.4349	18.5982	19.2178 (92)	
Temperature adjustment													0.0000
adjusted MIT	19.8412	19.3993	19.5098	19.4931	19.8910	20.1123	20.1599	20.1573	20.0135	19.4349	18.5982	19.2178 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9880	0.9649	0.9207	0.8153	0.6729	0.4908	0.3438	0.3912	0.6341	0.8754	0.9665	0.9898 (94)
Useful gains	2873.0846	3889.7283	4629.0000	4933.0740	4509.9369	3281.9811	2203.7956	2290.1764	3304.9617	3605.0587	3013.9358	2628.6350 (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)

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Heat loss rate W	10627.6715	9856.7034	8791.6598	6945.0056	5337.1221	3480.5774	2247.7733	2357.2634	3781.5784	5756.6684	7584.7110	10027.5197 (97)
Space heating kWh	5769.4127	4009.8073	3097.0189	1448.5908	615.4258	0.0000	0.0000	0.0000	0.0000	1600.7976	3290.9582	5504.7702 (98a)
Space heating requirement - total per year (kWh/year)												25336.7814
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	5769.4127	4009.8073	3097.0189	1448.5908	615.4258	0.0000	0.0000	0.0000	0.0000	1600.7976	3290.9582	5504.7702 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												25336.7814
Space heating per m2										(98c) / (4) =		31.5527 (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 %)												294.8385 (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	5769.4127	4009.8073	3097.0189	1448.5908	615.4258	0.0000	0.0000	0.0000	0.0000	1600.7976	3290.9582	5504.7702 (98)
Space heating efficiency (main heating system 1)	294.8385	294.8385	294.8385	294.8385	294.8385	0.0000	0.0000	0.0000	0.0000	294.8385	294.8385	294.8385 (210)
Space heating fuel (main heating system)	1956.8046	1360.0014	1050.4121	491.3167	208.7332	0.0000	0.0000	0.0000	0.0000	542.9406	1116.1902	1867.0461 (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	312.6783	276.1967	292.9218	256.7086	248.2019	222.9835	219.7351	228.9306	231.9331	259.3959	276.7124	309.1850 (64)
Efficiency of water heater	169.4228	169.4228	169.4228	169.4228	169.4228	169.4228	169.4228	169.4228	169.4228	169.4228	169.4228	169.4228 (216)
Fuel for water heating, kWh/month	184.5550	163.0222	172.8939	151.5195	146.4985	131.6136	129.6963	135.1238	136.8960	153.1056	163.3265	182.4931 (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	401.0889	362.2738	401.0889	388.1505	401.0889	388.1505	401.0889	401.0889	388.1505	401.0889	388.1505	401.0889 (231)
Lighting	115.3566	92.5434	83.3250	61.0475	47.1548	38.5259	43.0162	55.9141	72.6269	95.2904	107.6303	118.5627 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-119.3493	-188.5618	-302.0401	-361.0951	-398.3465	-362.0496	-358.1726	-326.5817	-271.4121	-219.7161	-135.0598	-100.0644 (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)	-26.5172	-66.3916	-159.8843	-293.3346	-437.2848	-469.7551	-458.3742	-369.4185	-248.6854	-114.0260	-40.3066	-20.3777 (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												8593.4450 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												169.4228
Water heating fuel used												1850.7442 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.7000, SFP = 1.6830)												
mechanical ventilation fans (SFP = 1.6830)												4722.4980 (230a)
Total electricity for the above, kWh/year												4722.4980 (231)
Electricity for lighting (calculated in Appendix L)												930.9940 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-5846.8050 (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												10250.8762 (238)

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

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	8593.4450	0.1561	1341.7967 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1850.7442	0.1410	260.8800 (264)
Space and water heating			1602.6767 (265)
Pumps, fans and electric keep-hot	4722.4980	0.1387	655.0687 (267)
Energy for lighting	930.9940	0.1443	134.3712 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3142.4491	0.1335	-419.5327
PV Unit electricity exported	-2704.3559	0.1210	-327.3190
Total			-746.8518 (269)
Total CO2, kg/year			1645.2648 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0500 (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	8593.4450	1.5780	13560.7793 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1850.7442	1.5212	2815.3892 (278)
Space and water heating			16376.1684 (279)
Pumps, fans and electric keep-hot	4722.4980	1.5128	7144.1950 (281)
Energy for lighting	930.9940	1.5338	1427.9897 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3142.4491	1.4934	-4692.8445
PV Unit electricity exported	-2704.3559	0.4440	-1200.7808
Total			-5893.6254 (283)
Total Primary energy kWh/year			19054.7278 (286)
Dwelling Primary energy Rate (DPER)			23.7300 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

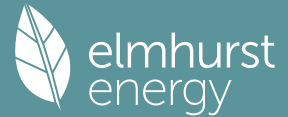
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	234.0000 (1b)	x 2.6500 (2b)	= 620.1000 (1b) -
First floor	234.0000 (1c)	x 3.0000 (2c)	= 702.0000 (1c) -
Second floor	234.0000 (1d)	x 3.1000 (2d)	= 725.4000 (1d) -
Third floor	101.0000 (1e)	x 2.5000 (2e)	= 252.5000 (1e) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	803.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	2300.0000 (5)

2. Ventilation rate

	m3 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) = 0.0174 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2674 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2273 (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)

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Adj infilt rate	0.2898	0.2841	0.2784	0.2500	0.2443	0.2159	0.2159	0.2102	0.2273	0.2443	0.2557	0.2671 (22b)
Effective ac	0.5420	0.5404	0.5388	0.5313	0.5298	0.5233	0.5233	0.5221	0.5258	0.5298	0.5327	0.5357 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			2.2100	1.0000	2.2100		(26)
TER Opening Type (Uw = 1.20)			132.5200	1.1450	151.7405		(27)
V53			1.1000	1.8519	2.0370		(27a)
V54			0.8800	1.8519	1.6296		(27a)
V55			1.1200	1.8519	2.0741		(27a)
V56			1.1200	1.8519	2.0741		(27a)
Heatloss Floor 1			234.0000	0.1300	30.4200		(28a)
External Wall 1	440.0000	130.1100	309.8900	0.1800	55.7802		(29a)
Basement wall retaining	52.7000		52.7000	0.1800	9.4860		(29a)
Garage wall	32.3500		32.3500	0.1800	5.8230		(29a)
Stud wall	40.0000		40.0000	0.1800	7.2000		(29a)
Dormer wall	47.0000	4.6200	42.3800	0.1800	7.6284		(29a)
Pitched roof	67.2000	4.2200	62.9800	0.1100	6.9278		(30)
Flat roof	38.9500		38.9500	0.1100	4.2845		(30)
Ceiling voids	133.0000		133.0000	0.1100	14.6300		(30)
Flat roof terrace	40.0000		40.0000	0.1100	4.4000		(30)
bay	2.1600		2.1600	0.1100	0.2376		(30)
Dormer roof	18.4000		18.4000	0.1100	2.0240		(30)
Total net area of external elements Aum(A, m2)			1145.7600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 310.6068		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

99.8653 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	65.6500	0.0500	3.2825
E3 Sill	64.7500	0.0500	3.2375
E4 Jamb	199.3000	0.0500	9.9650
E5 Ground floor (normal)	68.0000	0.1600	10.8800
E6 Intermediate floor within a dwelling	185.0000	0.0000	0.0000
E16 Corner (normal)	60.0000	0.0900	5.4000
R11 Upstands or kerbs of rooflights	16.8000	0.0800	1.3440
E16 Corner (normal)	28.8000	0.0900	2.5920
E14 Flat roof	19.8000	0.0800	1.5840
R4 Ridge (vaulted ceiling)	12.0000	0.0800	0.9600
E14 Flat roof	27.2000	0.0800	2.1760
E11 Eaves (insulation at rafter level)	33.0000	0.0400	1.3200
E14 Flat roof	30.0000	0.0800	2.4000
R8 Roof to wall (rafter)	33.0000	0.0600	1.9800
E17 Corner (inverted - internal area greater than external area)	41.9000	-0.0900	-3.7710

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

43.3500 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 353.9568 (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	411.3687	410.1312	408.9182	403.2208	402.1548	397.1926	397.1926	396.2737	399.1040	402.1548	404.3113	406.5657 (38)
Heat transfer coeff	765.3255	764.0880	762.8750	757.1776	756.1116	751.1494	751.1494	750.2304	753.0608	756.1116	758.2681	760.5225 (39)
Average = Sum(39)m / 12 =												757.1725

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9531	0.9515	0.9500	0.9429	0.9416	0.9354	0.9354	0.9343	0.9378	0.9416	0.9443	0.9471 (40)
HLP (average)												0.9429
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.7858 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	101.2245	99.7212	97.6042	93.7008	90.7780	87.5371	85.7865	87.8887	90.1776	93.6455	97.6292	100.8823 (42b)
Hot water usage for other uses	53.4007	51.4588	49.5170	47.5752	45.6333	43.6915	43.6915	45.6333	47.5752	49.5170	51.4588	53.4007 (42c)
Average daily hot water use (litres/day)												142.3971 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	154.6252	151.1800	147.1212	141.2760	136.4113	131.2286	129.4780	133.5220	137.7528	143.1625	149.0881	154.2830 (44)
Energy conte	244.8885	215.2783	226.1197	193.3997	183.6359	161.3608	156.5924	165.3281	169.8629	194.2701	212.4033	241.5698 (45)
Energy content (annual)										Total = Sum(45)m =		2364.7096
Distribution loss (46)m = 0.15 x (45)m	36.7333	32.2917	33.9180	29.0100	27.5454	24.2041	23.4889	24.7992	25.4794	29.1405	31.8605	36.2355 (46)
Water storage loss:												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.1127 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1409 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664 (56)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (57)
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 (59)
Total heat required for water heating calculated for each month	303.5173	268.2334	284.7486	250.1373	242.2647	218.0984	215.2212	223.9570	226.6005	252.8990	269.1409	300.1986 (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	303.5173	268.2334	284.7486	250.1373	242.2647	218.0984	215.2212	223.9570	226.6005	252.8990	269.1409	300.1986 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											3055.0166 (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)
Heat gains from water heating, kWh/month	128.3285	113.9441	122.0879	109.6955	107.9620	99.0425	98.9700	101.8747	101.8695	111.4979	116.0141	127.2250 (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	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	189.2915	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	414.0538	458.4167	414.0538	427.8555	414.0538	427.8555	414.0538	414.0538	427.8555	414.0538	427.8555	414.0538	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	797.0830	805.3542	784.5110	740.1382	684.1256	631.4816	596.3122	588.0409	608.8842	653.2569	709.2696	761.9135	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	41.9291	(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)	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	-151.4332	(71)
Water heating gains (Table 5)	172.4845	169.5596	164.0966	152.3548	145.1102	137.5591	133.0242	136.9283	141.4854	149.8627	161.1308	171.0014	(72)
Total internal gains	1466.4087	1516.1179	1445.4488	1403.1360	1326.0770	1276.6836	1223.1776	1218.8105	1258.0125	1299.9609	1381.0433	1429.7561	(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				26.7000	10.6334	0.6300	0.7000	0.7700	86.7671 (74)				
East				21.7000	19.6403	0.6300	0.7000	0.7700	130.2503 (76)				
South				57.2900	46.7521	0.6300	0.7000	0.7700	818.5617 (78)				
West				26.8300	19.6403	0.6300	0.7000	0.7700	161.0422 (80)				
North				1.9800	15.2954	0.6300	0.7000	1.0000	12.0201 (82)				
East				1.1200	25.9287	0.6300	0.7000	1.0000	11.5260 (82)				
West				1.1200	25.9287	0.6300	0.7000	1.0000	11.5260 (82)				
Solar gains	1231.6936	2144.7409	3045.9256	3940.0626	4549.7403	4572.8972	4385.7270	3924.9570	3356.0392	2401.6556	1484.0988	1048.2036	(83)
Total gains	2698.1022	3660.8588	4491.3743	5343.1986	5875.8173	5849.5808	5608.9046	5143.7675	4614.0518	3701.6165	2865.1421	2477.9597	(84)

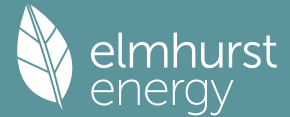
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.1059	29.1531	29.1994	29.4191	29.4606	29.6552	29.6552	29.6916	29.5800	29.4606	29.3768	29.2897	
alpha	2.9404	2.9435	2.9466	2.9613	2.9640	2.9770	2.9770	2.9794	2.9720	2.9640	2.9585	2.9526	
util living area	0.9918	0.9800	0.9571	0.9043	0.8105	0.6711	0.5322	0.5864	0.7908	0.9403	0.9845	0.9936	(86)
MIT	18.2436	18.6216	19.1530	19.8143	20.3782	20.7579	20.9121	20.8806	20.5755	19.7992	18.8874	18.1801	(87)
Th 2	20.1226	20.1239	20.1252	20.1312	20.1323	20.1375	20.1375	20.1385	20.1355	20.1323	20.1300	20.1276	(88)
util rest of house	0.9906	0.9770	0.9503	0.8884	0.7774	0.6108	0.4453	0.5006	0.7426	0.9273	0.9816	0.9926	(89)
MIT 2	16.8194	17.3025	17.9784	18.8111	19.4967	19.9308	20.0813	20.0574	19.7416	18.8053	17.6480	16.7410	(90)
Living area fraction	16.8691	17.3485	18.0193	18.8461	19.5275	19.9596	20.1103	20.0861	19.7707	18.8400	17.6912	16.7912	(92)
MIT	16.8691	17.3485	18.0193	18.8461	19.5275	19.9596	20.1103	20.0861	19.7707	18.8400	17.6912	16.7912	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Utilisation	0.9828	0.9621	0.9272	0.8585	0.7504	0.5970	0.4424	0.4949	0.7186	0.9007	0.9690	0.9862 (94)
Useful gains	2651.5823	3522.1499	4164.3979	4587.3017	4409.3793	3492.4831	2481.3294	2545.5750	3315.6012	3333.8970	2776.2923	2443.8664 (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	9619.4546	9511.7257	8787.7951	7530.9674	5918.4453	4025.8825	2636.7488	2765.4318	4270.3843	6230.3260	8030.9608	9575.9100 (97)
Space heating kWh	5184.0970	4024.9949	3439.8075	2119.4393	1122.7451	0.0000	0.0000	0.0000	0.0000	2154.9432	3783.3613	5306.2404 (98a)
Space heating requirement - total per year (kWh/year)												27135.6287
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	5184.0970	4024.9949	3439.8075	2119.4393	1122.7451	0.0000	0.0000	0.0000	0.0000	2154.9432	3783.3613	5306.2404 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												27135.6287
Space heating per m2										(98c) / (4) =		33.7928 (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 %)												92.3000 (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	5184.0970	4024.9949	3439.8075	2119.4393	1122.7451	0.0000	0.0000	0.0000	0.0000	2154.9432	3783.3613	5306.2404 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	5616.5732	4360.7745	3726.7687	2296.2506	1216.4086	0.0000	0.0000	0.0000	0.0000	2334.7163	4098.9830	5748.9062 (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	303.5173	268.2334	284.7486	250.1373	242.2647	218.0984	215.2212	223.9570	226.6005	252.8990	269.1409	300.1986 (64)
Efficiency of water heater	88.2495	88.1787	88.0409	87.7552	87.0574	79.8000	79.8000	79.8000	79.8000	87.7604	88.1398	79.8000 (216)
Fuel for water heating, kWh/month	343.9309	304.1931	323.4277	285.0397	278.2816	273.3062	269.7008	280.6478	283.9605	288.1697	305.3567	340.1031 (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)
(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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	86.0322	69.0182	62.1433	45.5288	35.1678	28.7324	32.0812	41.7004	54.1647	71.0670	80.2700	88.4233 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-189.0799	-252.6675	-344.0951	-365.3062	-375.8068	-343.4825	-338.1572	-327.1788	-306.5244	-277.1019	-202.3684	-165.0459 (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)
(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)	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)
(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)	-153.5422	-316.1970	-616.8003	-910.4688	-1189.4999	-1190.9332	-1177.9026	-1004.6979	-745.6764	-447.9883	-203.4710	-122.0440 (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)
(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)	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)
(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												29399.3810 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												3576.1177 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												694.3291 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-11566.0363 (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												22189.7916 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	29399.3810	0.2100	6173.8700 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3576.1177	0.2100	750.9847 (264)
Space and water heating			6924.8547 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	694.3291	0.1443	100.2131 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3486.8146	0.1358	-473.6780
PV Unit electricity exported	-8079.2217	0.1264	-1021.1779
Total			-1494.8559 (269)
Total CO2, kg/year			5542.1413 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			6.9000 (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	29399.3810	1.1300	33221.3006 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3576.1177	1.1300	4041.0130 (278)
Space and water heating			37262.3136 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	694.3291	1.5338	1064.9851 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3486.8146	1.5021	-5237.6919
PV Unit electricity exported	-8079.2217	0.4640	-3748.5913
Total			-8986.2832 (283)
Total Primary energy kWh/year			29471.1163 (286)
Target Primary Energy Rate (TPER)			36.7000 (287)