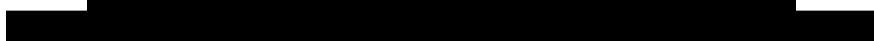




ENERGY STATEMENT

**New Dwelling at 35 Grays Lane
Hitchin
Hertfordshire
SG5 2HH**

December 2025





PROJECT DETAILS:

CLIENT: Pentangle Design Group
21a Bancroft
Hitchin
Hertfordshire
SG5 1JW

PROJECT: 35 Grays Lane
Hitchin
Hertfordshire
SG5 2HH

JOB NUMBER: 25353

REPORT NUMBER: 25353/ADF/R01

DATE ISSUED: December 2025

PREPARED BY:

Adrian Fell Director



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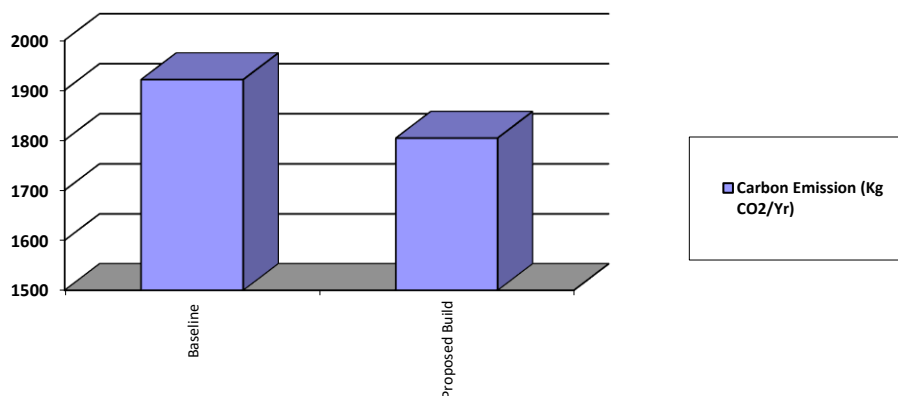
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1. Executive Summary

1.1 Overall results

From the calculations contained within this report, the CO² emissions are as follows;

	CO2 emissions (kg CO ₂ /Yr)	CO2 emissions savings %
Target Emission Rate CO ₂	1828	
Proposed Emission Rate CO ₂	5340	65.77



An average of 65.77% reduction in annual carbon emissions has been achieved, exceeding the recommended 35% reduction in carbon dioxide emissions as stipulated by North Herts Council planning policy.

The property will also achieve a regulated Energy use Intensity (EUI) of 18.07 kWh/m²/Pa.

Key energy efficient design measures

The development proposals include the provision of thermal elements (i.e. walls, floors, and roofs) and controlled fittings (i.e. windows and doors) in excess of the requirements of Part L1 of the Building Regulations 2021. Furthermore, the heating system shall perform in excess of the minimum requirements.

1.2 Summary of proposed heating systems

The proposed heating systems use a high efficiency gas condensing system boiler with appropriate controls for the size of the dwelling.

2. Introduction

Compass Energy Solutions Limited have been asked to produce an Energy Statement relating to a Planning Application for a new dwelling at 35 Grays Lane, Hitchin, Hertfordshire, SG5 2HH.

The requirement for newly created dwellings to reduce their carbon emissions below that as required by Building Regulations is now a well-established feature of Planning Policy. This Energy Statement sets out the applicable policies on energy, the methodology for, and the results from an energy demand assessment. It contains details of the energy efficiency measures being incorporated within the re-development and shows that these will reduce the total carbon dioxide emissions by over 65%.

It also includes an overview of possible renewable energy technologies and identifies the technology most suitable for this development and reasons why other technologies have had to be excluded.

3. Planning policies

North Herts Council Supplementary Planning Document for Sustainability sets out how the development proposals should comply to achieve the following;

Optimising Passive Design & Fabric Performance			
	Bronze	Silver	Gold
Minor residential schemes less than 10 dwellings	✓ Achieve an EPC rating of at least C on all dwellings ✓ Submit a Sustainability & Energy Statement showing compliance with Policy and Building Regulations (this should include the Energy Use Intensity (EUI) & the total Space Heating Demand (SHD) calculations with recommendations on methods that could be investigated during technical design to improve performance)	✓ Achieve 80% EPC ratings of at least B and 20% rating of at least C ✓ Submit a Sustainability & Energy Statement showing: • maximisation of solar gain through site layout, orientation, and design (for the purpose of energy efficiency) • measures to prevent over-heating • lower carbon alternatives to gas boilers • on-site reductions of 35% (minimum) in CO₂ emissions over and above Building Regulations Part L (including	✓ Achieve an EPC rating of B on all dwellings ✓ Submit a Sustainability & Energy Statement showing: • on-site reductions of 50% (minimum) in CO₂ emissions over and above Building Regs Part L (including at least 10% reductions through fabric first measures) • commitment to achieve Passivhaus certification and site assessment at planning stage using Passive House Planning Package (PHPP) to confirm
		- at least 10% reductions through fabric first measures) (inclusive of MHVR) • EUI ≤ 60 kWh/m²/yr (inclusive of estimated unregulated energy) (RIBA 2025) • SHD ≤ 30 kWh/m²/yr (Passivhaus low energy building) or ≤ 40 kWh/m²/yr (AECB/ Energiesprong new build)	- compliance against Passivhaus Classic, Plus or Premium. - Or • assessment of the development using CIBSE TM54 or alternative operational energy modelling software and confirms compliance with LETI or RIBA 2030 standards: ○ EUI ≤ 35 kWh/m²/yr ○ SHD ≤ 15 kWh/m²/yr

4. Calculation methodology

The energy demand has been predicted in accordance with the requirements set out above. The space heating, hot water and lighting energy demand was calculated using the SAP 10 calculation methodology, and referenced in the current version of the Building Regulations (Part L1 2021).

The starting point was to determine the performance of the "compliant case" for the dwelling, using the typical orientation and a level of insulation and building services equipment performance consistent with the development achieving compliance with Approved Document L1 2021. The specific energy consumption figures for space heating, hot water and lighting were then extracted. The calculations were then repeated using the U-values, boiler efficiency, proportion of dedicated low energy lighting, and heating controls proposed for the scheme. These results permitted the benefit of the energy efficiency measures to be determined.

These "actual case" results were then used when evaluating the options for renewable energy needed and the saving in carbon dioxide emissions that the proposed technologies could provide. The results obtained from this analysis are presented in the following sections and summarised graphically in Section 1.

5. Energy demand and efficiency

5.1 Baseline assessment

The total energy demand has been calculated taking full account of energy demands for space heating and hot water, and electricity for pumps, fans, lights and appliances. The "compliant case" was determined by using the typical orientation for each dwelling and the use of building elements (walls, windows etc.) with U-values consistent with achieving compliance with Approved Document Part LA: 2013.

The baseline threshold U-Values are as follows;

Heat loss floors	0.13 W/m ² K
Walls:	0.18 W/m ² K
Roofs:	0.11 W/m ² K
Doors:	1.00 W/m ² K
Windows:	1.15 W/m ² K
Boilers:	92.4% efficient condensing system boiler with programmer, room thermostat and TRV's
Air Permeability	5.0 m ³ /hm ²
Ventilation	Standard intermittent extract fans

5.2 Energy efficiency measures

Having established a "compliant case" the calculations were repeated using the actual heating system, proposed U-values, actual proposed proportion of dedicated low energy light fittings.

The actual proposed U-Values are as follows;

Heat loss floors	0.11 W/m ² K
External walls	0.17 W/m ² K
Roofs	0.13 – 0.14 W/m ² K
Doors:	0.80 W/m ² K
Windows:	0.90 W/m ² K
Heating:	2 x Mitsubishi Ecodan 11.2kW air source heat pumps with underfloor heating
Air Permeability	4.0 m ³ /hm ²
Ventilation	Decentralised Mechanical Ventilation with heat recovery

Table 1 - Proposed Carbon Emission Figures

Annual Emissions (kg CO ₂ /yr)	5340
Improved Annual Emissions (kg CO ₂ /yr)	1828
Percentage Improvement	65.77%

6. Consideration of Combined Heat and Power and Trigenation systems

Combined Heat and Power (CHP) and Combined Cooling Heat and Power (CCHP) or Trigenation Systems are recognised as a very desirable way of reducing energy wastage and resulting carbon dioxide emissions. While generally operating on fossil fuel, mainly natural gas, their advantage is that the waste heat normally associated with electricity generation is put to good use providing space heating and hot water. This means that the overall fuel efficiency can be increased significantly — typically to above 80% compared to 30 — 40% for grid electricity. The main effect is to approximately halve the carbon dioxide emissions associated with electricity use on the development for all the electricity produced by the CHP plant.

However community heating systems are not considered to be viable on developments of less than approximately 100 units. Although micro-CHP devices are now becoming more available data to support energy and carbon saving from CHP is still developing and "these devices are unlikely to be appropriate for highly insulated houses with small heat losses" (ODPM, 2006).

For these reasons CHP is not regarded as viable on this development.

7. Consideration of Renewable Energy Technologies

7.1 Overview of renewable energy

Renewable energy is defined as energy derived from energy flows that occur naturally and repeatedly in the environment. It may be contrasted with energy sources that can be depleted such as fossil fuels or nuclear power.

Renewable energy technologies, can be summarised as follows:

- Solar thermal — direct heating of water for space heating or domestic hot water;
- Photovoltaic — direct generation of electricity from sunlight;
- Hydroelectricity — use of water cycle driven flows to generate electricity;
- Wind turbines — use of solar driven air movement to generate electricity;
- Heat pumps — extraction of heat from the earth, atmosphere or water bodies;
- Bio-fuels — combustion of solid or liquid bio-fuels to produce heat or electricity;

The technologies, and their potential application to this site are discussed in more detail in the following sections. However, one further pertinent point must be made. The reason for adopting renewable energy technologies is to reduce greenhouse gas emissions — mainly carbon dioxide. And none of the technologies are wholly "zero carbon".

This is because when the whole life cycle is taken into account some energy has to be put into every system to manufacture and maintain the equipment (which has a finite life) or to operate the equipment, and generally at present this energy is derived from non-renewable sources. Examples include the energy needed to refine and process the silicon used to manufacture photovoltaic panels and the diesel fuel used to produce and transport wood pellets.

Finally, due to the constantly changing and innovative nature of the renewable energy industry even similar products can differ in vital practical details which means that detailed design of installations must be undertaken

by experts, often working closely with the product manufacturers, as virtually no two products are identical or interchangeable.

The following sections contain a summary of each technology that is potentially applicable and a comparison of the advantages and disadvantages of technologies relevant to this development.

7.2 Solar thermal panels

A typical solar thermal (hot water) panel can provide 400 kWh of useable hot water per year for every square metre of panel. However, the maximum panel area that can generally be used on a typical house is 6m² to avoid excessive summer panel temperatures or the need for an over-sized hot water cylinder, and in fact the calculated usable output per m² drops rapidly with panels above 3 m². This is likely to limit the maximum carbon dioxide saving. However, due to the lower carbon savings associated with this technology, solar thermal panels are not suitable on this development.

7.3 Photovoltaic panels

Photovoltaic panels are panels of semiconductor material that produce electricity when exposed to light. They are connected to the building electricity supply via a device called an inverter which converts the output to a form which is compatible with the mains electricity voltage and frequency. This also allows excess electricity to be exported at times when the instantaneous demand from the dwellings is less than that being produced by the panels. This ensures that all the electricity produced is used and achieves a reduction in carbon dioxide emissions. For all purposes relating to Planning, the exported electricity is by convention treated as if it were used on site.

The output of photovoltaic panels is generally specified as kW peak, or kWp. The panel area required to produce an output of 1 kWp varies with panel technology, but a typical 1 kWp mono-crystalline panel would have an area of 7m² and produce an annual electricity output of 830kWh.

Due to the cost of the systems, PV has been considered unsuitable on this development.

7.4 Hydroelectricity

There is no water source nearby which could be utilised as an energy source. Also, to site a plant within a water course requires a licence from the Authority (who own or manage it) which is usually granted at a high cost, thus making the payback period less attractive than other forms of low or zero carbon technologies. Hydroelectricity has been considered unsuitable on this development.

7.5 Wind turbines

Micro wind turbines produce electricity and can be grid-connected in the same way as photovoltaic panels. Although wind turbines are one of the most cost effective renewable energy technologies, for smaller turbines the capital cost is relatively high compared to the amount of power generated. Adjacent buildings create turbulence and the location affects wind speed and to be effective an average wind speed of no less than 5m/s is required. Due to the location of the site, along with the installation cost, the development is considered unsuitable for a wind turbine.

7.6 Heat pumps

Heat pumps collect low temperature heat from renewable sources and concentrate it to a usable temperature. Fossil fuel based (grid) electricity is generally required to operate the pumps and the renewable component of the output is therefore by convention taken as the difference between the output energy and the input energy. A typical heat pump will deliver 3 kWh of useful energy for every 1 kWh of input energy. A heat pump operating in this way would therefore be deemed to have delivered 2 kWh of renewable energy.

In this case, ground source heat pumps are considered not to be feasible due to the cost. However, air source heat pumps are more cost effective, and significantly reduce carbon emissions. Therefore, air source heat pumps are considered suitable for this development.

7.7 Bio-fuels

Key planning and design issues include the building space and organisation to accommodate and operate the plant. The plant would be floor standing, requiring floor space of potentially 1000x1500m for access and maintenance. Facilities are required for ash disposal and sufficient fuel storage must be provided along with loading access for the fuel to be safely and efficiently delivered and stored. It is also often the case that wood fuel costs more than gas reducing the economic benefit of such a scheme particularly in small dwellings.

This option is considered to be unsuitable due to the restricted site and therefore limited floor space available for any plant and storage space.

8. Renewable energy proposals and results

Based on the review completed in the preceding section, air source heat pumps have been selected as the most appropriate technology.

Whilst it is not technically or financially feasible to improve the fabric energy efficiency so that 10% carbon savings can be accomplished when compared to the notional building, the fact that a 65.77% carbon reduction improvement over and above Part L1 2021 compliance is a considerable achievement.

In addition, the property will also achieve a regulated Energy use Intensity (EUI) of 18.07 kWh/m²/Pa.

9. Water Efficiency

North Herts Council requires that new residential developments are designed so that mains water consumption would meet a target of 110 litres or less per head per day, including an allowance of 5 litres or less per head per day for external water consumption.

The calculation methodology is contained within Approved Document G of the Building Regulations, and the proposed specification to achieve the 110 litres per person per day is listed in the table below.

PRODUCT	SPECIFICATION	PARAMETER
W/C	5/2.5 Dual Flush	Litres Per Flush
Basin Taps	4	Litres per Minute
Kitchen Taps	6	Litres per Minute
Shower	9	Litres per Minute
Bath	170	Litres per Minute
Washing Machine	8.17	Litres per Kilo dry load
Dishwasher	1.25	Litres per Place Setting
Total Consumption (Litres / Person / Day)		109.9

10. Conclusion

The results show that the development proposal meets the applicable planning policies that relate to energy conservation and carbon reduction.

Compared to the Part L1 2021 compliant baseline referenced in this report, the development proposals include energy efficiency measures that reduce the carbon dioxide emissions by in excess of the recommended target.

Appendix 1 – SAP Worksheets

Plot Reference	35 Grays Lane, Hitchin		Issued on Date	15/12/2025	
Assessment Reference	Energy Statement	Plot Type Ref			
Plot Address	35, Grays Lane, Hitchin, Herts, SG5 2HH		SAP Version	10.2	
SAP Rating	84 B	DER	2.73	TER	7.97
Environmental	97 A	% DER < TER	65.75		
CO ₂ Emissions (t/year)	1.73	DFEE	41.06	TFEE	41.35
Compliance Check	See BREL	% DFEE < TFEE	0.71		
% DPER < TPER	34.04	DPER	28.18	TPER	42.72
Mr. Adrian Fell		Assessor ID	N222-0001		
Client	Pentangle Design Architects, Jon Read				

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)	
Main dwelling						
Basement floor	236.3800 (1a)	x	2.7300 (2a)	=	645.3174 (1a)	- (3a)
Ground floor	168.7100 (1b)	x	2.9500 (2b)	=	497.6945 (1b)	- (3b)
First floor	151.3800 (1c)	x	2.7700 (2c)	=	419.3226 (1c)	- (3c)
Second floor	113.2400 (1d)	x	2.8000 (2d)	=	317.0720 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	669.7100				(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1879.4065 (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	1 * 10 =	10.0000 (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 10.0000 / (5) = 0.0053 (8)	
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000 (17)	
Infiltration rate		0.2053 (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) =	0.1745 (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	0.2225	0.2182	0.2138	0.1920	0.1876	0.1658	0.1658	0.1614	0.1745	0.1876	0.1963	0.2051 (22b)
Mechanical extract ventilation - decentralised												
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)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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							
Windows			48.5400	0.8687	42.1680		(27)
Glazed Doors			10.9200	1.1450	12.5038		(27)
Solid Door			1.8900	1.0000	1.8900		(26)
Velux			1.0800	0.7752	0.8372		(27a)
Basement Floor			236.3800	0.1100	26.0018	110.0000	26001.8000 (28)
Floor Over Garage			8.6000	0.1200	1.0320	0.0000	0.0000 (28b)
Basement Wall	175.5900		175.5900	0.1500	26.3385	190.0000	33362.1000 (29a)
Cavity Wall	303.9100	57.5700	246.3400	0.1700	41.8778	110.0000	27097.4000 (29a)
Dormer	10.0000	1.8900	8.1100	0.1800	1.4598	9.0000	72.9900 (29a)
Sheltered Wall	22.7400	1.8900	20.8500	0.1700	3.5445	140.0000	2919.0000 (29a)
GF Flat Roof	19.3700		19.3700	0.1400	2.7118	9.0000	174.3300 (30)
Pitched Roof	165.1900	1.0800	164.1100	0.1400	22.9754	9.0000	1476.9900 (30)
Crown Roof	65.4000		65.4000	0.1300	8.5020	9.0000	588.6000 (30)

$$C_p = \sum (A_i \times C_{p,i}) \quad (28) \dots (30) + (32) + (32a) \dots (32e) = 192343.4400 \quad (34)$$

Thermal bridges (Sum(L x Psi) calculated using Appendix K)			
Point Thermal bridges	(36a) =	0.0000	(36)
Total fabric heat loss	(33) + (36) + (36a) =	246.8552	(37)

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												3.6126 (42)
Hot water usage for mixer showers	95.3895	93.9560	91.8671	87.8703	84.9208	81.6315	79.7619	81.8350	84.1075	87.6392	91.7218	95.0240 (42a)
Hot water usage for baths	36.5860	36.0426	35.2775	33.8667	32.8103	31.6389	31.0062	31.7660	32.5933	33.8467	35.2865	36.4623 (42b)
Hot water usage for other uses	51.6262	49.7488	47.8715	45.9942	44.1169	42.2396	42.2396	44.1169	45.9942	47.8715	49.7488	51.6262 (42c)
Average daily hot water use (litres/day)												168.7998 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	183.6016	179.7475	175.0161	167.7312	161.8480	155.5100	153.0077	157.7179	162.6950	169.3574	176.7572	183.1125 (44)
Energy content (annual)	290.7801	255.9580	268.9932	229.6156	217.8785	191.2177	185.0495	195.2877	200.6192	229.8164	251.8230	286.7099 (45)
Distribution loss (46)m = 0.15 x (45)m	43.6170	38.3937	40.3490	34.4423	32.6818	28.6827	27.7574	29.2932	30.0929	34.4725	37.7735	43.0065 (46)
Water storage loss (or HIU loss):												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.3800 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.2852 (55)
Total storage loss	39.8412	35.9856	39.8412	38.5560	39.8412	38.5560	39.8412	39.8412	38.5560	39.8412	38.5560	39.8412 (56)
If cylinder contains dedicated solar storage	39.8412	35.9856	39.8412	38.5560	39.8412	38.5560	39.8412	39.8412	38.5560	39.8412	38.5560	39.8412 (57)
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	353.8837	312.9548	332.0968	290.6836	280.9821	252.2857	248.1531	258.3913	261.6872	292.9200	312.8910	349.8135 (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	353.8837	312.9548	332.0968	290.6836	280.9821	252.2857	248.1531	258.3913	261.6872	292.9200	312.8910	349.8135 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											3546.7427 (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	147.1673	130.7035	139.9231	125.2016	122.9275	112.4343	112.0118	115.4160	115.5603	126.8968	132.5856	145.8139 (65)

[illegible]

6. Solar gains

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ԵՐԱՐԽՈՒՄԻ

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	95.9297	95.9297	95.9297	95.9297	95.9297	95.9297	95.9297	95.9297	95.9297	95.9297	95.9297	95.9297
alpha	7.3953	7.3953	7.3953	7.3953	7.3953	7.3953	7.3953	7.3953	7.3953	7.3953	7.3953	7.3953
util living area	1.0000	1.0000	0.9998	0.9983	0.9859	0.9088	0.7414	0.8143	0.9785	0.9994	1.0000	1.0000 (86)
Living	20.1216	20.2085	20.3473	20.5433	20.7436	20.8968	20.9475	20.9379	20.8181	20.5577	20.3013	20.1029
Non living	19.1615	19.2731	19.4511	19.7022	19.9554	20.1291	20.1682	20.1634	20.0480	19.7210	19.3921	19.1375
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5506	20.2085	20.3473	20.5433	20.7436	20.8968	20.9475	20.9379	20.8181	20.5577	20.3013	20.2284 (87)
Th2 (88a)m	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260 (88a)
ni2,m (89a)m	1.0000	0.9999	0.9997	0.9974	0.9770	0.8526	0.6266	0.7072	0.9596	0.9990	1.0000	1.0000 (89a)
MIT2 (90a)m	19.8016	19.2731	19.4511	19.7022	19.9554	20.1291	20.1682	20.1634	20.0480	19.7210	19.3921	19.3336 (90a)
Th2 (88b)m	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260	20.2260 (88b)
ni2,m (89b)m	1.0000	0.9999	0.9997	0.9974	0.9770	0.8526	0.6266	0.7072	0.9596	0.9990	1.0000	1.0000 (89b)
MIT2 (90b)m	19.1615	19.2731	19.4511	19.7022	19.9554	20.1291	20.1682	20.1634	20.0480	19.7210	19.3921	19.1375 (90b)
MIT 2	19.4404	19.2731	19.4511	19.7022	19.9554	20.1291	20.1682	20.1634	20.0480	19.7210	19.3921	19.2230 (90c)
Living area fraction									fLA = Living area / (4) =			0.1138 (91)
MIT	19.5668	19.3795	19.5531	19.7980	20.0451	20.2164	20.2569	20.2515	20.1356	19.8162	19.4955	19.3374 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5668	19.3795	19.5531	19.7980	20.0451	20.2164	20.2569	20.2515	20.1356	19.8162	19.4955	19.3374 (93)

8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	1.0000	0.9999	0.9996	0.9967	0.9741	0.8518	0.6315	0.7111	0.9565	0.9987	0.9999	1.0000 (94)
Useful gains	1918.7639	2352.0905	2685.4995	3074.3501	3248.7963	2835.2356	2008.9932	2083.3106	2550.2024	2257.8577	1945.2995	1809.2692 (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	8502.9545	8064.4836	7270.0293	6069.7035	4647.8541	3128.1224	2036.7396	2145.1488	3361.5753	5133.0321	6903.7832	8430.8746 (97)
Space heating kWh	4898.6378	3838.7282	3410.8901	2156.6545	1040.8990	0.0000	0.0000	0.0000	0.0000	2139.1298	3570.1083	4926.4744 (98a)
Space heating requirement - total per year (kWh/year)												25981.5222
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	4898.6378	3838.7282	3410.8901	2156.6545	1040.8990	0.0000	0.0000	0.0000	0.0000	2139.1298	3570.1083	4926.4744 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												25981.5222
Space heating per m2											(98c) / (4) =	38.7952 (99)

[illegible]

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Basement floor	236.9800 (1a)	x 2.7300 (2a)	= 645.3174 (1a) - (3a)
Ground floor	169.7100 (1b)	x 2.9500 (2b)	= 497.6945 (1b) - (3b)
First floor	151.3800 (1c)	x 2.7700 (2c)	= 419.3226 (1c) - (3c)
Second floor	113.2400 (1d)	x 2.8000 (2d)	= 317.0720 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	669.7100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1879.4065 (5)

Solar heating contribution - total per year (kWh/year)													0.0000
Space heating kWh	4875.7761	3927.7557	3505.5510	2222.2116	1109.1339	0.0000	0.0000	0.0000	0.0000	2186.9055	3616.3126	4948.9307	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												26392.5772	
Space heating per m2										(98c) / (4) =		39.4090	(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	4875.7761	3927.7557	3505.5510	2222.2116	1109.1339	0.0000	0.0000	0.0000	0.0000	2186.9055	3616.3126	4948.9307	(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)	5282.5310	4255.4233	3797.9967	2407.5965	1201.6619	0.0000	0.0000	0.0000	0.0000	2369.3451	3917.9985	5361.7884	(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	293.8602	259.7652	276.0353	243.2624	236.1023	213.0969	210.7399	219.0289	221.3065	246.3171	261.2850	290.7622	(64)
Efficiency of water heater (217)m	88.2343	88.1831	88.0749	87.8227	87.0764	79.8000	79.8000	79.8000	79.8000	87.7976	88.1302	79.8000	(216)
Fuel for water heating, kWh/month	333.0452	294.5749	313.4096	276.9926	271.1439	267.0388	264.0850	274.4723	277.3264	280.5510	296.4759	329.4841	(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	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	88.3661	70.8906	63.8291	46.7639	36.1218	29.5118	32.9515	42.8316	55.6341	72.9949	82.4476	90.8221	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-184.9782	-244.1647	-328.3372	-343.9214	-350.0132	-318.5735	-313.8079	-305.7187	-289.5439	-265.8531	-196.9860	-161.8662	(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)	-161.1286	-330.4858	-642.3314	-944.8294	-1231.2141	-1231.4487	-1217.6717	-1039.7044	-773.3588	-466.6120	-212.9812	-128.1437	(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												28594.3415	(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												3478.5999	(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)												713.1650	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-11683.6737	(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												21188.4327	(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	28594.3415	0.2100	6004.8117	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3478.5999	0.2100	730.5060	(264)
Space and water heating			6735.3177	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	713.1650	0.1443	102.9318	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-3303.7639	0.1361	-449.7473	
PV Unit electricity exported	-8379.9098	0.1265	-1060.1189	
Total			-1509.8663	(269)
Total CO2, kg/year			5340.3124	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.9700	(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	28594.3415	1.1300	32311.6058	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3478.5999	1.1300	3930.8179	(278)
Space and water heating			36242.4237	(279)

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