

Energy Statement

88 Alexandra Park Road

Job number: S10766

Date: June 2023

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Revision	Issue Date	Author	Checked	Description
0	16/06/2023	CT	PK	First Issue

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1 Executive Summary

This report has been produced by Base Energy on behalf of Mukhbinder Chana and in support of the planning application for the development named as 88 Alexandra Park Road comprising of the conversion of two floors of an existing building into two flats and the construction of two new build flats and two semi-detached dwellings falling under the requirements of Haringey District Council.

It sets out the design approach with regards to energy, carbon dioxide emissions, and sustainability in order to ensure the development complies with:

- National Planning Policy
- The London Plan Policy SI 2 Minimising greenhouse gas emissions
- The Haringey Local Plan SP4 Working Towards A Low Carbon Haringey.

The above policies require:

- A 25 per cent reduction in CO₂ over Part L 2021 and should aim be zero carbon from 2016.
- All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from onsite renewable energy regeneration.
- A 10 per cent reduction through energy efficiency measures alone.
- The GLA expects all major development proposals to maximise on-site renewable energy generation. This is regardless of whether the 35 per cent on-site target has already been reached through earlier stages of the energy hierarchy. In particular, solar PV should be maximised on roof spaces.

The design of the development will incorporate energy efficient building fabric and services in addition to low carbon technology:

- Thermal specification exceeding or meeting Part L 2021 notional U-values.
- A design which limits air permeability, targeting 3.
- A design which limits thermal bridging by incorporating targeting the notional ψ -value 0.05

-
- Energy saving building services including low energy lighting, shower wastewater heat recovery, heating controls and DMEV.
 - Solar PV Panels - 16.8kWp for the total development with 3kWp for plots 2 and 4 and 2.7kWp for each new build plot.
 - ASHP to be installed in the new build plots.

This results in a 49% reduction in CO2 emissions over part L1 2021. For the new build elements of the assessment these are achieving a 98% CO2 reduction over Part L1 2021.

2 Existing and Proposed Development

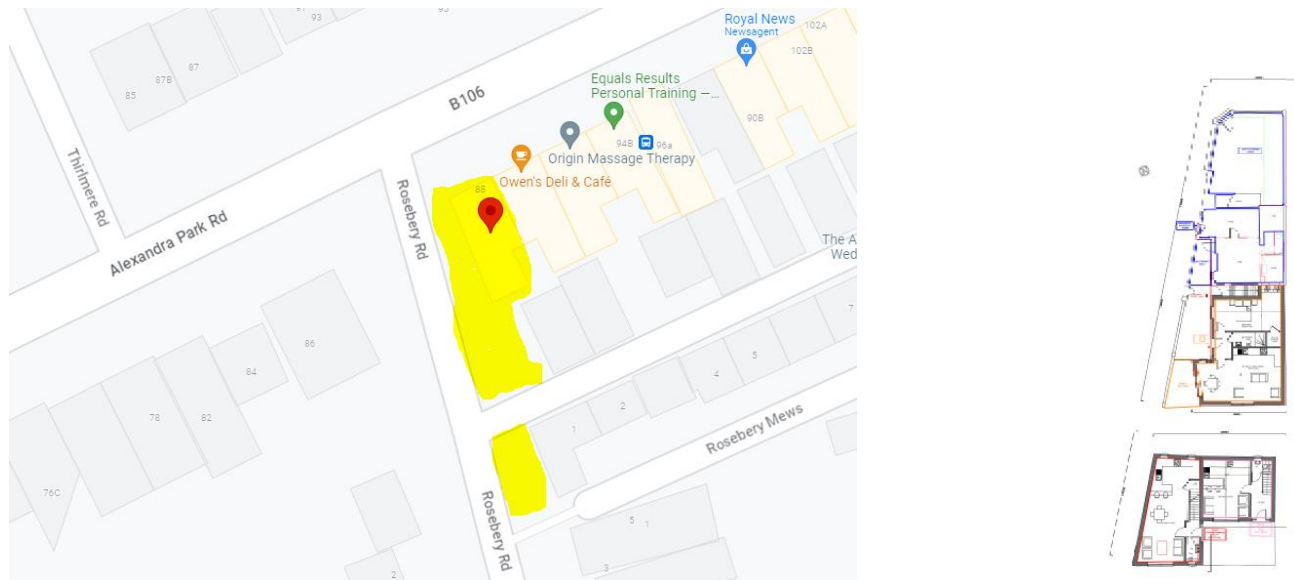
The development site is located on land at 88 Alexandra Park Road in London.

The development proposals are for of the conversion of two floors of an existing building into two flats and the construction of two new build flats as well as 2 semi-detached dwellings.

The development proposals constitute a minor Development.

Aspects of the site location, shape, and surroundings (in particular the adjacent buildings), along with any other requirements of planning, use type, and scale will naturally constrain the development proposals in terms of the layout, positioning, and orientation of the proposed development. Subsequently, these constraints will impact on the feasibility of certain renewable technologies (as discussed in Section 4 of this report).

Figure 2.1: Site Location and proposals



3 Planning Policy

National Planning Policy Framework 2021

The NPPF was updated in July 2021 to place greater emphasis on beauty, place-making, the environment, and sustainable development. The strengthened environmental objectives aim to protect and enhance the natural, built, and historic environment, and encourage effective land use, greater biodiversity, prudent use of natural resources, minimisation of waste and pollution, and adaptation to climate change alongside a move to a low carbon economy.

Local Planning Policy

The relevant Haringey Local Planning Policy requirements are as follows.

The development should target:

SP4: Working towards a Low Carbon Haringey

- All new residential development will aim to be zero carbon from 2016 onwards.
- The Council will promote low- and zero-carbon energy generation through the following measures: a. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network.
- All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from onsite renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.

4 Methodology

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

The Simplified Building Energy Model (SBEM) is the UK Government methodology for assessing and calculating the energy performance of non-domestic buildings.

SAP and SBEM calculations take into account a range of factors that contribute to energy efficiency, including:

- Materials used for the construction and the thermal insulation of the building fabric (u-values¹ and thermal mass)
- Air permeability
- Efficiency, fuel source, and control of heating and cooling systems
- Ventilation system energy use and heat recovery
- Lighting energy
- Low carbon and energy saving or generating technologies

Approved Document Part L of current Building Regulations addresses the conservation of fuel and power. Part L is divided into two separate documents:

- Part L1 Newly constructed and extended or renovated existing dwellings
- Part L2 Newly constructed and extended or renovated existing non-domestic buildings

To comply with Part L, the calculations should demonstrate how the building will either meet or achieve a percentage reduction in the Building Emission Rate (BER) under the required Target Emission Rate (TER).

The calculation software has been used to calculate a baseline of energy demand and carbon dioxide emissions as appropriate from which any reductions or contributions have been measured.

¹ U-values (Thermal Transmittance) - the measure of the overall rate of heat transfer by all mechanisms under standard conditions, through a particular section of a construction. Lower u-values mean better thermal insulation

5 Baseline Energy & CO2

Energy modelling software has been used to calculate a baseline for the development. This forms the basis from which compliance with planning policy has been measured.

Table 5.1: Total Site - Baseline CO2

	CO2 Emission Rate (kg CO2/m2/year)	Total Baseline Emissions (kg CO2/year)
Baseline	20	7,497

The **Total Baseline CO2 Emissions** for the development are shown to be 7,497 kg/year.

Table 5.2: New build Baseline CO2 emissions

	CO2 Emission Rate (kg CO2/m2/year)	Total Baseline Emissions (kg CO2/year)
Baseline	12.8	2,893

The **Baseline Energy Demand** for the development is shown to be 2,893 kWh per year.

6 Low Carbon Design – Fabric First – Be Lean

Before considering low carbon energy generating technology the development has been designed to reduce energy demand through the first step of the energy hierarchy by considering 'fabric first'. A thermally efficient building envelope will follow the design standards as set out below.

Table 6.0: Building Fabric Standards (including u-values W/m²K)

	Part L 2013 Limiting Parameters	Part L 2021 Limiting Parameters	Part L 2021 Notional Targets	Proposed Development
Walls	0.30	0.26	0.18	0.15
Ground Floor	0.25	0.18	0.13	0.12
Roof	0.20	0.16	0.11	0.10
Windows	2.00	1.6	1.2	1.2
Doors	2.00	1.6	1.0	1.0
Air permeability	10.00	8.00	5.00	3.00

- Insulation: The specified building envelope is designed to exceed the notional Part L targets and will help to limit the energy demand of the dwelling for space heating
- Thermal bridging: The design will seek to limit heat loss through thermal bridging targeting a global 'y-value' of 0.05

Once heat retention has been addressed the next step is to ensure energy consuming building services are efficient.

- Lighting: Low energy LED lighting throughout with a minimum efficacy of 80 lumens per watt
- Space & Water Heating: Condensing gas boiler
- Heating Controls: Comprising delayed start and programmer, thermostat, and TRVs
- Ventilation: Decentralised mechanical extract fans.
- A Shower waste water heat recovery systems with a 0.972 utilisation factor and 43.6% efficiency.

The specifications outlined above, and with the heating provided by a gas system as required by the GLA guidance, have been incorporated into the calculation to generate a dwelling emission rate to be measured against the baseline data.

Table 6.1: Total site - Baseline vs Be Lean CO2 With Notional PV saving

	Total Baseline Emissions (kg CO2/year)	Reduction in CO2
Baseline	7,497	N/A
Be Lean	4,906	35%

The **CO2 Emissions reduction** as a result of energy efficient fabric and services is shown to be 2,591 kg/year.

Table 6.2: New Build - Baseline vs Be Lean CO2 With Notional PV saving

	Total Baseline Emissions (kg CO2/year)	Reduction in CO2
Baseline	2,893	N/A
Be Lean	578	80%

The **CO2 Emissions reduction** as a result of energy efficient fabric and services is shown to be 2,316 kg/year.

7 Low Carbon Technology Review & Recommendations

Having set out an energy efficient design, the next step is to incorporate low carbon technology for energy generation. A number of technologies exist and should be specified where they:

- compliance with planning policy
- are feasible for the site
- are cost efficient
- are appropriate for proposed development form and function
- protect against fuel poverty
- promote fuel security
- reduce reliance on fossil fuels
- reduce carbon emissions
- reduce resource depletion
- reduce pollution

Site location and development form and function will influence the suitability of different technologies through:

- Orientation
- Space (inside and outside of the buildings)
- Surrounding topography, structures, and natural features
- Wind speed
- Overshading
- Geology and ground conditions
- Building form, function, and density

In determining the most feasible renewable technologies for the dwelling, the following have been reviewed:

- Wind turbines
- Ground Source Heat Pumps
- Air Source Heat Pumps
- Biomass
- Combined Heat and Power
- Photovoltaic Panels
- Solar water heating

WIND TURBINES

Wind turbines are used to produce electricity. They can be either pole mounted (in a suitably exposed position) or building mounted; building mounted systems need a sufficient wind speed at the structural height and both a structural survey and planning permission.

- Wind speed can be too low on low rise buildings
- Taller systems need sufficient space
- Wind resources very variable and unpredictable
- May need planning permission

Wind turbines technology is **not recommended** for this development

GROUND SOURCE HEAT PUMP (GSHP)

GSHPs use naturally occurring underground low-level heat in areas with appropriate geological features. Heat is transferred from the ground by either extracting and discharging (re-charging) water from/to the ground directly (open loop) or circulating water through pipes buried within the ground, (closed loop). The water is passed through a heat pump to transfer the heat from this water into a higher temperature water circuit to provide heating. The loop can be fitted horizontally (laid in a shallow trench) or vertically (in a borehole).

- Feasibility analysis is costly
- Suitable ground conditions required
- More capital intensive than air source heat pumps
- Can be more efficient and lower running costs than ASHPs
- Well suited to highly insulated buildings

Ground source heat pump technology is **not recommended** for this development

AIR SOURCE HEAT PUMP (ASHP)

ASHP systems absorb heat from outside air at a low temperature into a fluid which is then passed through an electrically driven compressor where its temperature is increased. There are two main types of ASHP systems: Air to Water systems distribute heat through wet central heating; Air to air produce warm air which is circulated by fans. For an ASHP system to be installed, there needs to be ample outdoor space for the external condensing unit; these units can also be noisy and blow out colder air to the neighbouring environment.

- Requires space for external plant and internal hot water tank for wet systems supplying DHW
- Can generate noise though quieter systems have been developed
- Least efficient when most needed
- Longer life than fossil fuel boilers
- High capital costs vs gas systems but lower than GSHPs
- Well suited to highly insulated buildings

Air source heat pump technology **is recommended** for this development

BIOMASS

Biomass systems burn wood pellets, chips, or logs to provide heat in a single room, or to power central heating and hot water boilers. There needs to be ample space available for both the boiler and the storage of fuel. There will also be regular deliveries of fuel and therefore adequate site access is required.

- Carbon emissions are cyclical unlike fossil fuel
- Requires fuel storage space and bulk delivery
- Carbon 'neutral' fuel in isolation but supply side emissions are still present so not neutral overall
- Harmful particulate emissions impact air quality and health

Biomass technology **is not recommended** for this development

COMBINED HEAT AND POWER (CHP)

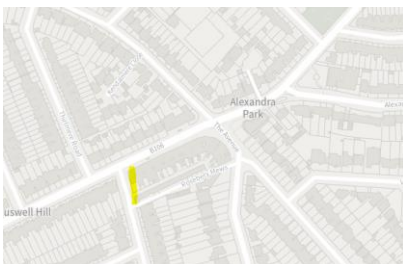
CHP is effectively an on-site small power plant providing both electrical power and thermal heat energy. It is an energy efficiency and low carbon measure rather than a renewable energy technology. A CHP system operates by burning a primary fuel (normally natural gas) by use of either a reciprocating engine or turbine, which in turn drives an alternator to generate electrical power. The heat emitted by the engine and exhaust gases is recovered and used to heat the building or to provide hot water.

- Reduces consumption of and reliance on grid electricity
- Works best with high and consistent heat and hot water demand
- Recovers waste energy
- Can export to the grid
- Uses fossil fuel
- Emissions on site rather than upstream
- Efficiency is sensitive to sizing

CHP **is not recommended** for this development

DISTRICT HEATING

District Heating systems provide multiple buildings or dwellings with heat and hot water from a central boiler house, or 'energy centre'. The system can provide heating or cooling which is transferred from the energy centre through a network of highly insulated pipes carrying the heated water to each dwelling.



- Economies of scale
- Frees up space in habitable areas of development
- Variety of systems
- Can make use of waste heat from industry
- Can be fossil fuel based and dependent

With reference to the Local Heat Map it has been determined that there are no existing or proposed heat networks or energy centres within a suitable radius from the development and there are no existing networks local to the site.

District heating **is not recommended** for this development

SOLAR PHOTOVOLTAIC (PV)

Solar PV cells (which are mounted together in panels or tiles on the roof) convert sunlight into electricity. The cells are made from layers of semi-conducting material; when the light shines on the cell, an electric field is created across the layers. Although PV cells are most effective in bright sunlight, they can still generate electricity on a cloudy day. The power of a PV cell is measured in kilowatts peak (kWp). Each PV panel produces 0.25Watts to 0.35Watts depending on the manufacture.

- Passive technology, requires no energy input from grid
- Does not require sunny days to generate power
- Capital costs can be high although payback is effective
- Needs sufficient roof space and orientation
- Zero site or upstream emissions
- Can export to the grid

Solar PV technology **is recommended** for this development.

SOLAR HOT WATER

Solar hot water systems absorb energy from the sun and transfer this energy using heat exchangers to heat water which can then be stored. Systems should be roof mounted and oriented to face between a south-east and south-west direction.

- Mostly passive technology but requires pump energy
- Not suitable for combi boilers and developments without roof space
- Lower CO2 reductions than other technologies

Solar hot water technology **is not recommended** for this development

Low Carbon Technology Summary

The low carbon technology review indicates that Solar PV and ASHP would be potentially feasible. The following low carbon technology is recommended:

Solar PV and ASHP for the new build plots.

This technology is deemed optimal for meeting the needs of the development and achieving policy compliance. It has been incorporated into the energy model and the results are presented in the next section.

8 Low Carbon Technology – Renewable Energy Generation - Be Green

The selected Low Carbon Technology has been incorporated into the calculation and the results are set out below.

Table 8.1: Total site - Baseline vs Be Lean & Green CO2

	Total Baseline Emissions (kg CO2/year)	Reduction in CO2
Baseline	7,497	N/A
Lean & Green Design	3,846	49%

The **CO2 Emissions reduction** as a result of energy efficient fabric and services is shown to be 1,060 kg/year.

Table 8.2: New Build - Baseline vs Be Lean & Green CO2

	Total Baseline Emissions (kg CO2/year)	Reduction in CO2
Baseline	7,497	N/A
Lean & Green Design	71	98%

The **CO2 Emissions reduction** as a result of energy efficient fabric and services is shown to be 479 kg/year.

Table 8.3: Total Site - CO2 reduction from the incorporation of renewable technologies – Be Lean vs Be Green CO2

	Total Baseline Emissions (kg CO2/year)	Reduction in CO2
Be Lean	5,856	N/A
Be Green	3,846	35%

The **CO2 Emissions reduction** as a result of energy efficient fabric and services is shown to be 2,010 kg/year.

9 Conclusion

Proposals are for the development named as 88 Alexandra Park Road comprising of the conversion of two floors of an existing building into two flats and the construction of two new build flats and two semi-detached dwellings falling under the requirements of Haringey District Council.

- Under the local planning policy the proposed development is required to meet a 25 per cent reduction in CO₂ over Part L 2021 and should aim be zero carbon from 2016.
- All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from onsite renewable energy regeneration.
- A 10 per cent reduction through energy efficiency measures alone.

Energy modelling software has been used to calculate a baseline against which compliance with the above can be measured.

The proposed development will be designed to limit energy demand through the inclusion of a thermally efficient building fabric and energy efficient services.

Low carbon technology will be incorporated and is to comprise solar PV panels and for the new build plots an ASHP will be installed for space heating and hot water.

This results in a 49% CO₂ reduction over Part L1 2021 with a 98% CO₂ reduction from the new build elements of the development. The development also produced a 35% CO₂ reduction from low and zero carbon technologies.

This Energy Statement and the calculations on which it is based demonstrate that the proposed development complies with the local planning policy requirements.

10 Appendix 1 – Conversion - DER/TER Notional

Full SAP Calculation Printout



Property Reference	S10766 02	Issued on Date	04/08/2023
Assessment Reference	Notional	Prop Type Ref	
Property			
SAP Rating	74 C	DER	31.33
Environmental	74 C	TER	9.19
CO ₂ Emissions (t/year)	2.04	% DER < TER	-240.91
Compliance Check	See BREL	DFEE	99.59
% DPER < TPER	-248.52	TFEE	43.53
		% DFEE < TFEE	-128.76
		TPER	49.18
Assessor Details	Mr. Peter Kinsella	Assessor ID	L770-0002
Client			

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	74.4700 (1b)	x 2.8600 (2b)	= 212.9842 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.4700		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.9842 (5)

2. Ventilation rate

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

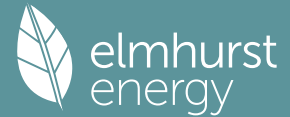
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0939 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.8439	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6540 (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	0.8339	0.8175	0.8012	0.7194	0.7031	0.6213	0.6213	0.6050	0.6540	0.7031	0.7358	0.7685 (22b)
Effective ac	0.8477	0.8342	0.8209	0.7588	0.7472	0.6930	0.6930	0.6830	0.7139	0.7472	0.7707	0.7953 (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
Windows (U _w = 2.60)			21.0000	2.3551	49.4565		(27)
Door			1.8900	1.0000	1.8900		(26)
EXPOSED FLOOR SHOP			74.4700	0.2500	18.6175		(28b)
Old External wall	73.2986	21.0000	52.2986	0.3000	15.6896		(29a)
Corridor wall	23.9700	1.8900	22.0800	0.1700	3.7536		(29a)
Total net area of external elements A _{um} (A, m ²)			171.7386				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	89.4072	(33)
Party Wall 1			22.4200	0.0000	0.0000		(32)

Full SAP Calculation Printout



Party Ceiling 1	74.4700	(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		34.3477 (36)
Point Thermal bridges		0.0000 (36a) =
Total fabric heat loss	(33) + (36) + (36a) =	123.7549 (37)

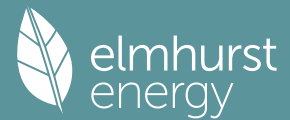
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	59.5790	58.6301	57.7000	53.3313	52.5139	48.7089	48.7089	48.0043	50.1745	52.5139	54.1674	55.8961 (38)
Average = Sum(39)m / 12 =	183.3339	182.3850	181.4549	177.0862	176.2688	172.4638	172.4638	171.7592	173.9294	176.2688	177.9224	179.6510 (39)
												177.0823
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.4618	2.4491	2.4366	2.3780	2.3670	2.3159	2.3159	2.3064	2.3356	2.3670	2.3892	2.4124 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.3496 (42)
Hot water usage for mixer showers												111.9101 (42a)
Hot water usage for baths												0.0000 (42b)
Hot water usage for other uses												38.6921 (42c)
Average daily hot water use (litres/day)												138.7488 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	151.0326	147.9373	144.0702	137.9562	133.0756	127.7948	125.5930	129.4415	133.5248	139.0911	145.3061	150.6022 (44)
Energy content (annual)	239.1987	210.6608	221.4306	188.8552	179.1453	157.1387	151.8938	160.2756	164.6494	188.7452	207.0152	235.8066 (45)
Distribution loss (46)m = 0.15 x (45)m												2304.8152
Water storage loss:												150.0000 (47)
Store volume												1.8900 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.0206 (55)
Enter (49) or (54) in (55)												
Total storage loss												31.6386 (56)
If cylinder contains dedicated solar storage												31.6386 (57)
Primary loss												23.2624 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												290.7076 (62)
WWHRS												0.0000 (63a)
PV diverter												0.0000 (63b)
Solar input												0.0000 (63c)
FGHRS												0.0000 (63d)
Output from w/h												290.7076 (64)
12Total per year (kWh/year)												2951.2302 (64)
Electric shower(s)												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												122.3265 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	104.6586	115.8720	104.6586	108.1472	104.6586	108.1472	104.6586	104.6586	108.1472	104.6586	108.1472	104.6586 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	207.4974	209.6505	204.2246	192.6735	178.0922	164.3879	155.2325	153.0794	158.5053	170.0564	184.6377	198.3420 (68)
Pumps, fans	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833 (71)
Total internal gains	165.9333	163.2665	157.9926	146.2477	139.0949	131.6008	126.9160	130.6619	135.0694	143.3852	154.6341	164.4173 (72)
	539.3330	550.0329	528.1195	508.3121	483.0895	462.3797	445.0509	446.6436	459.9656	479.3440	508.6628	528.6617 (73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		FF	Access factor Table 6d	Gains W
North	5.4300				10.6334		0.6300		0.7000			0.7700	17.6459 (74)
South	1.7500				46.7521		0.6300		0.7000			0.7700	25.0041 (78)
West	11.6800				19.6403		0.6300		0.7000			0.7700	70.1071 (80)
Northwest	2.1400				11.2829		0.6300		0.7000			0.7700	7.3792 (81)
Solar gains	120.1362	226.8373	362.3850	524.8412	648.8574	668.7979	634.7033	539.8680	419.0436	265.4001	148.1070	99.9952 (83)	
Total gains	659.4692	776.8702	890.5045	1033.1533	1131.9468	1131.1776	1079.7542	986.5116	879.0092	744.7441	656.7698	628.6569 (84)	
7. Mean internal temperature (heating season)													
Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.2082	28.3550	28.5003	29.2035	29.3389	29.9862	29.9862	30.1092	29.7335	29.3389	29.0662	28.7865	
alpha	2.8805	2.8903	2.9000	2.9469	2.9559	2.9991	2.9991	3.0073	2.9822	2.9559	2.9377	2.9191	
util living area	0.9906	0.9842	0.9710	0.9361	0.8653	0.7407	0.6068	0.6621	0.8512	0.9574	0.9850	0.9919 (86)	
MIT	18.2018	18.4719	18.9400	19.6170	20.2225	20.6842	20.8770	20.8372	20.4651	19.6801	18.8553	18.1975 (87)	
Th 2	19.0432	19.0507	19.0581	19.0933	19.0999	19.1311	19.1311	19.1369	19.1190	19.0999	19.0865	19.0726 (88)	
util rest of house	0.9869	0.9780	0.9590	0.9071	0.7975	0.5996	0.3879	0.4482	0.7463	0.9320	0.9780	0.9888 (89)	
MIT 2	16.6590	16.9310	17.3966	18.0723	18.6266	19.0085	19.1101	19.1037	18.8622	18.1524	17.3363	16.6730 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	17.1158	17.3872	17.8536	18.5297	19.0992	19.5047	19.6333	19.6170	19.3368	18.6047	17.7860	17.1244 (92)	
Temperature adjustment	0.0000												
adjusted MIT	17.1158	17.3872	17.8536	18.5297	19.0992	19.5047	19.6333	19.6170	19.3368	18.6047	17.7860	17.1244 (93)	
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9814	0.9701	0.9482	0.8955	0.7975	0.6330	0.4544	0.5123	0.7620	0.9224	0.9707	0.9838 (94)	
Useful gains	647.1723	753.6570	844.3495	925.2194	902.6871	716.0368	490.6467	505.3937	669.8393	686.9431	637.5452	618.4823 (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	2349.5715	2277.4816	2060.1726	1705.2881	1304.2445	845.8835	523.1263	552.5429	910.8287	1410.9831	1901.2856	2321.8789 (97)	
Space heating kWh	1266.5850	1024.0102	904.5724	561.6494	298.7587	0.0000	0.0000	0.0000	0.0000	538.6857	909.8932	1267.3271 (98a)	
Space heating requirement - total per year (kWh/year)	6771.4816												
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	1266.5850	1024.0102	904.5724	561.6494	298.7587	0.0000	0.0000	0.0000	0.0000	538.6857	909.8932	1267.3271 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	6771.4816												
Space heating per m2	(98c) / (4) = 90.9290 (99)												
9a. Energy requirements - Individual heating systems, including micro-CHP													
Fraction of space heat from secondary/supplementary system (Table 11)													
Fraction of space heat from main system(s)													
Efficiency of main space heating system 1 (in %)													
Efficiency of main space heating system 2 (in %)													
Efficiency of secondary/supplementary heating system, %													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1266.5850	1024.0102	904.5724	561.6494	298.7587	0.0000	0.0000	0.0000	0.0000	538.6857	909.8932	1267.3271 (98)	
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)	
Space heating fuel (main heating system)	1423.1293	1150.5732	1016.3735	631.0668	335.6839	0.0000	0.0000	0.0000	0.0000	605.2648	1022.3519	1423.9630 (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	294.0997	260.2488	276.3316	241.9852	234.0463	210.2687	206.7948	215.1766	217.7794	243.6462	260.1452	290.7076 (64)	
Efficiency of water heater	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000 (216)	
Fuel for water heating, kWh/month	330.4491	292.4144	310.4849	271.8935	262.9734	236.2569	232.3537	241.7714	244.6960	273.7598	292.2980	326.6377 (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	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)	

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Lighting	23.3950	18.7683	16.8988	12.3808	9.5633	7.8133	8.7239	11.3397	14.7291	19.3254	21.8280	24.0452 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												7608.4063 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												89.0000
Water heating fuel used												3315.9890 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												188.8107 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												11199.2061 (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	7608.4063	0.2100	1597.7653 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3315.9890	0.2100	696.3577 (264)
Space and water heating			2294.1230 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	188.8107	0.1443	27.2512 (268)
Total CO2, kg/year			2333.3035 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			31.3300 (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	7608.4063	1.1300	8597.4992 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3315.9890	1.1300	3747.0676 (278)
Space and water heating			12344.5668 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	188.8107	1.5338	289.6042 (282)
Total Primary energy kWh/year			12764.2718 (286)
Dwelling Primary energy Rate (DPER)			171.4000 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.4700 (1b)	x 2.8600 (2b)	= 212.9842 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.4700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.9842 (5)

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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													3 * 10 =	30.0000 (7a)
Number of passive vents													0 * 10 =	0.0000 (7b)
Number of flueless gas fires													0 * 40 =	0.0000 (7c)
													Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =													30.0000 / (5) =	0.1409 (8)
Pressure test													Yes	
Pressure Test Method													Blower Door	
Measured/design AP50													5.0000 (17)	
Infiltration rate													0.3909 (18)	
Number of sides sheltered													3 (19)	
Shelter factor													(20) = 1 - [0.075 x (19)] = 0.7750 (20)	
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.3029 (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	0.3862	0.3786	0.3711	0.3332	0.3256	0.2878	0.2878	0.2802	0.3029	0.3256	0.3408	0.3559	(22b)	
Effective ac	0.5746	0.5717	0.5688	0.5555	0.5530	0.5414	0.5414	0.5393	0.5459	0.5530	0.5581	0.5633	(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			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.20)			16.7000	1.1450	19.1221			(27)				
EXPOSED FLOOR SHOP			74.4700	0.1300	9.6811			(28b)				
Old External wall	73.2986	16.7000	56.5986	0.1800	10.1877			(29a)				
Corridor wall	23.9700	1.8900	22.0800	0.1800	3.9744			(29a)				
Total net area of external elements Aum(A, m2)			171.7386					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.8554			(33)				
Party Wall 1			22.4200	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (User defined value 0.050 * total exposed area)								8.5869 (36)				
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	53.4423	(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	40.3843	40.1807	39.9812	39.0441	38.8687	38.0525	38.0525	37.9014	38.3669	38.8687	39.2234	39.5943 (38)
Heat transfer coeff	93.8266	93.6230	93.4235	92.4864	92.3111	91.4949	91.4949	91.3437	91.8092	92.3111	92.6658	93.0366 (39)
Average = Sum(39)m / 12 =												92.4856
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2599	1.2572	1.2545	1.2419	1.2396	1.2286	1.2286	1.2266	1.2328	1.2396	1.2443	1.2493 (40)
HLP (average)												1.2419
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3496 (42)
Hot water usage for mixer showers	81.7022	80.4744	78.6852	75.2619	72.7356	69.9183	68.3170	70.0926	72.0390	75.0640	78.5608	81.3891 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	38.6921	37.2851	35.8781	34.4711	33.0641	31.6572	31.6572	33.0641	34.4711	35.8781	37.2851	38.6921 (42c)
Average daily hot water use (litres/day)												110.5013 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	120.3943	117.7595	114.5633	109.7330	105.7998	101.5755	99.9741	103.1567	106.5102	110.9421	115.8459	120.0812 (44)
Energy content (annual)	190.6751	167.6879	176.0795	150.2190	142.4268	124.8989	120.9100	127.7296	131.3377	150.5473	165.0437	188.0182 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1835.5738
Water storage loss:	28.6013	25.1532	26.4119	22.5329	21.3640	18.7348	18.1365	19.1594	19.7007	22.5821	24.7566	28.2027 (46)

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Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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	237.2700	209.7736	222.6744	195.3109	189.0217	169.9907	167.5049	174.3245	176.4295	197.1422	210.1355	234.6131 (62)
WVHRS	-37.3508	-33.0334	-34.5906	-28.6424	-26.6937	-22.8420	-21.4107	-22.7682	-23.6332	-27.8609	-31.5631	-36.6591 (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	199.9192	176.7402	188.0838	166.6685	162.3280	147.1487	146.0942	151.5563	152.7963	169.2813	178.5724	197.9540 (64)
12Total per year (kWh/year)												2037.1429 (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	100.6754	89.4248	95.8224	86.0213	84.6328	77.6024	77.4785	79.7460	79.7433	87.3329	90.9505	99.7920 (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)
(66)m	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.6483	115.8606	104.6483	108.1365	104.6483	108.1365	104.6483	104.6483	108.1365	104.6483	108.1365	104.6483	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.4974	209.6505	204.2246	192.6735	178.0922	164.3879	155.2325	153.0794	158.5053	170.0564	184.6377	198.3420	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	(71)
Water heating gains (Table 5)	135.3164	133.0726	128.7935	119.4740	113.7538	107.7810	104.1378	107.1855	110.7545	117.3829	126.3201	134.1290	(72)
Total internal gains	508.7058	519.8275	498.9101	481.5278	457.7380	438.5492	422.2623	423.1569	435.6401	453.3314	480.3381	498.3631	(73)

6. Solar gains

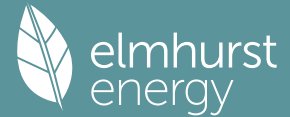
[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North			4.3200		10.6334		0.6300		0.7000		0.7700		14.0387 (74)
South			1.3900		46.7521		0.6300		0.7000		0.7700		19.8604 (78)
West			9.2900		19.6403		0.6300		0.7000		0.7700		55.7616 (80)
Northwest			1.7000		11.2829		0.6300		0.7000		0.7700		5.8620 (81)
Solar gains	95.5226	180.3685	288.1607	417.3571	515.9854	531.8461	504.7318	429.3105	333.2197	211.0350	117.7638		79.5073 (83)
Total gains	604.2284	700.1960	787.0708	898.8849	973.7235	970.3953	926.9941	852.4674	768.8598	664.3664	598.1020		577.8704 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.1179	55.2378	55.3557	55.9166	56.0228	56.5226	56.5226	56.6161	56.3291	56.0228	55.8084	55.5860
alpha	4.6745	4.6825	4.6904	4.7278	4.7349	4.7682	4.7682	4.7744	4.7553	4.7349	4.7206	4.7057
util living area	0.9928	0.9850	0.9656	0.9023	0.7699	0.5807	0.4296	0.4842	0.7380	0.9387	0.9855	0.9941 (86)
MIT	19.6353	19.8456	20.1600	20.5639	20.8459	20.9687	20.9939	20.9895	20.9063	20.5235	20.0113	19.6023 (87)
Th 2	19.8724	19.8745	19.8766	19.8866	19.8885	19.8972	19.8972	19.8988	19.8938	19.8885	19.8847	19.8807 (88)
util rest of house	0.9905	0.9802	0.9544	0.8719	0.7079	0.4902	0.3244	0.3727	0.6498	0.9124	0.9799	0.9922 (89)
MIT 2	18.3103	18.5780	18.9730	19.4645	19.7675	19.8808	19.8954	19.8954	19.8350	19.4319	18.7977	18.2742 (90)
Living area fraction	fLA = Living area / (4) =											0.2961 (91)
MIT	18.7026	18.9533	19.3245	19.7900	20.0868	20.2029	20.2207	20.2194	20.1522	19.7551	19.1570	18.6674 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7026	18.9533	19.3245	19.7900	20.0868	20.2029	20.2207	20.2194	20.1522	19.7551	19.1570	18.6674 (93)

8. Space heating requirement

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9870	0.9749	0.9474	0.8688	0.7199	0.5161	0.3557	0.4058	0.6721	0.9086	0.9750	0.9892	(94)
Useful gains	596.3887	682.6256	745.6536	780.9840	700.9694	500.8001	329.6934	345.9639	516.7622	603.6114	583.1333	571.6516	(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	1351.3488	1315.7173	1198.1083	1007.1771	774.1954	512.6339	331.2726	348.8751	555.6498	845.1170	1117.2754	1346.0016	(97)
Space heating kWh	561.6903	425.4376	336.6263	162.8590	54.4801	0.0000	0.0000	0.0000	0.0000	179.6802	384.5823	576.1164	(98a)
Space heating requirement - total per year (kWh/year)												2681.4724	
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	561.6903	425.4376	336.6263	162.8590	54.4801	0.0000	0.0000	0.0000	0.0000	179.6802	384.5823	576.1164	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2681.4724	
Space heating per m2										(98c) / (4) =		36.0074	(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)

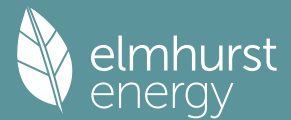
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	561.6903	425.4376	336.6263	162.8590	54.4801	0.0000	0.0000	0.0000	0.0000	179.6802	384.5823	576.1164	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	608.5486	460.9292	364.7089	176.4453	59.0251	0.0000	0.0000	0.0000	0.0000	194.6697	416.6656	624.1782	(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	199.9192	176.7402	188.0838	166.6685	162.3280	147.1487	146.0942	151.5563	152.7963	169.2813	178.5724	197.9540	(64)
Efficiency of water heater (217)m	86.2467	85.9548	85.3496	84.0079	81.8854	79.8000	79.8000	79.8000	79.8000	84.1937	85.7340	79.8000	(216)
Fuel for water heating, kWh/month	231.7992	205.6201	220.3687	198.3961	198.2379	184.3969	183.0754	189.9202	191.4741	201.0617	208.2867	229.3506	(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	21.7438	17.4437	15.7061	11.5070	8.8883	7.2618	8.1082	10.5394	13.6896	17.9615	20.2875	22.3482	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-57.6013	-75.7636	-101.7190	-106.6303	-108.9142	-99.6062	-98.3552	-95.6851	-90.2919	-82.7374	-61.3506	-50.4649	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-51.4375	-105.2763	-204.0839	-299.3824	-389.2413	-388.7183	-384.1276	-328.1818	-244.5688	-148.0211	-67.8069	-40.9008	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2905.1705	(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												2441.9877	(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)		175.4853 (232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation		-3680.8663 (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		1927.7771 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2905.1705	0.2100	610.0858 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2441.9877	0.2100	512.8174 (264)
Space and water heating			1122.9032 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	175.4853	0.1443	25.3279 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1029.1197	0.1361	-140.0435
PV Unit electricity exported	-2651.7466	0.1266	-335.7276
Total			-475.7712 (269)
Total CO2, kg/year			684.3893 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.1900 (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	2905.1705	1.1300	3282.8426 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2441.9877	1.1300	2759.4461 (278)
Space and water heating			6042.2887 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	175.4853	1.5338	269.1652 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1029.1197	1.5030	-1546.7803
PV Unit electricity exported	-2651.7466	0.4648	-1232.4349
Total			-2779.2152 (283)
Total Primary energy kWh/year			3662.3395 (286)
Target Primary Energy Rate (TPER)			49.1800 (287)

11 Appendix 2 - Conversion - DER/TER Be Lean

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Property Reference	S10766 02				Issued on Date	04/08/2023
Assessment Reference	Be Lean		Prop Type Ref			
Property						
SAP Rating	75 C	DER	29.26	TER	10.38	
Environmental	76 C	% DER < TER				-181.89
CO ₂ Emissions (t/year)	1.87	DFEE	93.23	TFEE	43.53	
Compliance Check	See BREL	% DFEE < TFEE				-114.15
% DPER < TPER	-188.50	DPER	160.40	TPER	55.60	
Assessor Details	Mr. Peter Kinsella				Assessor ID	L770-0002
Client						

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	74.4700 (1b)	x 2.8600 (2b)	= 212.9842 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.4700		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.9842 (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)

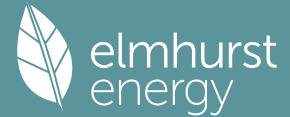
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	No
Measured/design AP50	Blower Door
Infiltration rate	15.0000 (17)
Number of sides sheltered	0.7500 (18)
	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.5813 (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	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.9911	0.9766	0.9620	0.8894	0.8748	0.8022	0.8022	0.7877	0.8313	0.8748	0.9039	0.9330 (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
Windows (Uw = 2.60)			21.0000	2.3551	49.4565		(27)
Door			1.8900	1.0000	1.8900		(26)
EXPOSED FLOOR SHOP			74.4700	0.1500	11.1705		(28b)
Old External wall	73.2986	21.0000	52.2986	0.2400	12.5517		(29a)

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Corridor wall	23.9700	1.8900	22.0800	0.1700	3.7536	(29a)
Total net area of external elements Aum(A, m2)			171.7386			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	78.8223		(33)
Party Wall 1			22.4200	0.0000	0.0000	(32)
Party Ceiling 1			74.4700			(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)						34.3477 (36)
Point Thermal bridges					(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =	113.1700 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	69.6588	68.6375	67.6162	62.5095	61.4882	56.3816	56.3816	55.3603	58.4242	61.4882	63.5309	65.5735	(38)
Average = Sum(39)m / 12 =	182.8288	181.8075	180.7862	175.6795	174.6582	169.5516	169.5516	168.5303	171.5942	174.6582	176.7009	178.7435	(39)
												175.4242	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	2.4551	2.4414	2.4276	2.3591	2.3453	2.2768	2.2768	2.2631	2.3042	2.3453	2.3728	2.4002	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3496 (42)
Hot water usage for mixer showers	87.4699	86.1554	84.2399	80.5750	77.8703	74.8541	73.1398	75.0407	77.1246	80.3630	84.1067	87.1348	(42a)
Hot water usage for baths	27.4795	27.0714	26.4967	25.4371	24.6436	23.7638	23.2886	23.8592	24.4806	25.4221	26.5035	27.3866	(42b)
Hot water usage for other uses	38.6921	37.2851	35.8781	34.4711	33.0641	31.6572	31.6572	33.0641	34.4711	35.8781	37.2851	38.6921	(42c)
Average daily hot water use (litres/day)												141.2968	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	153.6415	150.5119	146.6147	140.4832	135.5781	130.2751	128.0855	131.9641	136.0763	141.6632	147.8953	153.2135	(44)
Energy content (annual)	243.3306	214.3270	225.3414	192.3144	182.5142	160.1884	154.9083	163.3992	167.7957	192.2356	210.7040	239.8953	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2346.9541	
	36.4996	32.1490	33.8012	28.8472	27.3771	24.0283	23.2362	24.5099	25.1694	28.8353	31.6056	35.9843	(46)

Water storage loss:													
Total storage 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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	31.0152	28.0093	31.0008	29.9802	30.9665	29.9545	30.9444	30.9512	29.9605	30.9743	29.9949	31.0124	(61)
Total heat required for water heating calculated for each month	274.3458	242.3363	256.3422	222.2946	213.4807	190.1429	185.8527	194.3504	197.7563	223.2099	240.6989	270.9077	(62)
WWHRS	-48.0341	-42.4817	-44.4844	-36.8348	-34.3288	-29.3754	-27.5347	-29.2804	-30.3929	-35.8299	-40.5909	-47.1445	(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	226.3117	199.8546	211.8578	185.4597	179.1519	160.7675	158.3180	165.0700	167.3634	187.3801	200.1080	223.7632	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2265.4059	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)

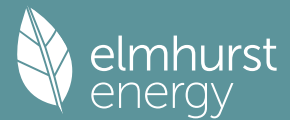
Heat gains from water heating, kWh/month	88.6612	78.2660	82.6762	71.4396	68.4276	60.7513	59.2431	62.0680	63.2822	71.6619	77.5578	87.5183	(65)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	104.6586	115.8720	104.6586	108.1472	104.6586	108.1472	104.6586	104.6586	108.1472	104.6586	108.1472	104.6586	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	207.4974	209.6505	204.2246	192.6735	178.0922	164.3879	155.2325	153.0794	158.5053	170.0564	184.6377	198.3420	(68)
Pumps, fans	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	(71)
Total internal gains	119.1683	116.4673	111.1239	99.2216	91.9726	84.3768	79.6278	83.4248	87.8920	96.3198	107.7192	117.6321	(72)
	492.5680	503.2337	481.2509	461.2861	435.9671	415.1556	397.7627	399.4065	412.7882	432.2786	461.7478	481.8765	(73)

6. Solar gains

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[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	5.4300				10.6334		0.6300		0.7000		0.7700		17.6459 (74)	
South	1.7500				46.7521		0.6300		0.7000		0.7700		25.0041 (78)	
West	11.6800				19.6403		0.6300		0.7000		0.7700		70.1071 (80)	
Northwest	2.1400				11.2829		0.6300		0.7000		0.7700		7.3792 (81)	
Solar gains	120.1362	226.8373	362.3850	524.8412	648.8574	668.7979	634.7033	539.8680	419.0436	265.4001	148.1070	99.9952	(83)	
Total gains	612.7043	730.0709	843.6359	986.1273	1084.8245	1083.9535	1032.4660	939.2745	831.8319	697.6787	609.8549	581.8717	(84)	
7. Mean internal temperature (heating season)														
Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	28.2862	28.4451	28.6058	29.4373	29.6094	30.5012	30.5012	30.6860	30.1381	29.6094	29.2671	28.9327		
alpha	2.8857	2.8963	2.9071	2.9625	2.9740	3.0334	3.0334	3.0457	3.0092	2.9740	2.9511	2.9288		
util living area	0.9922	0.9865	0.9746	0.9422	0.8749	0.7525	0.6201	0.6766	0.8642	0.9634	0.9876	0.9934	(86)	
MIT	18.1561	18.4282	18.8990	19.5884	20.2018	20.6781	20.8737	20.8328	20.4468	19.6473	18.8175	18.1569	(87)	
Th 2	19.0472	19.0553	19.0635	19.1047	19.1130	19.1552	19.1552	19.1637	19.1382	19.1130	19.0964	19.0799	(88)	
util rest of house	0.9892	0.9812	0.9639	0.9155	0.8102	0.6142	0.4016	0.4645	0.7649	0.9412	0.9818	0.9909	(89)	
MIT 2	16.6164	16.8910	17.3608	18.0548	18.6215	19.0279	19.1330	19.1285	18.8667	18.1316	17.3058	16.6375	(90)	
Living area fraction	fLA = Living area / (4) =													
MIT	17.0723	17.3462	17.8163	18.5089	19.0894	19.5165	19.6484	19.6331	19.3345	18.5804	17.7534	17.0874	(92)	
Temperature adjustment	-0.1500													
adjusted MIT	16.9223	17.1962	17.6663	18.3589	18.9394	19.3665	19.4984	19.4831	19.1845	18.4304	17.6034	16.9374	(93)	
8. Space heating requirement														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9839	0.9733	0.9523	0.9008	0.8025	0.6334	0.4484	0.5084	0.7682	0.9289	0.9745	0.9862	(94)	
Useful gains	602.8467	710.5919	803.4365	888.3129	870.5660	686.5786	462.9100	477.5082	638.9985	648.0873	594.3246	573.8658	(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	2307.7162	2235.5360	2018.7074	1661.7363	1264.4280	808.1738	491.4264	519.5959	872.4784	1367.6442	1855.9599	2276.7191	(97)	
Space heating kWh	1268.4229	1024.7624	904.1615	556.8648	293.0334	0.0000	0.0000	0.0000	0.0000	535.3503	908.3774	1266.9229	(98a)	
Space heating requirement - total per year (kWh/year)	6757.8957													
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												0.0000	
Space heating kWh	1268.4229	1024.7624	904.1615	556.8648	293.0334	0.0000	0.0000	0.0000	0.0000	535.3503	908.3774	1266.9229	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	6757.8957													
Space heating per m2	(98c) / (4) =												90.7466 (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 %)													88.7000 (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	1268.4229	1024.7624	904.1615	556.8648	293.0334	0.0000	0.0000	0.0000	0.0000	535.3503	908.3774	1266.9229	(98)	
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)	
Space heating fuel (main heating system)	1430.0145	1155.3128	1019.3478	627.8070	330.3646	0.0000	0.0000	0.0000	0.0000	603.5517	1024.1008	1428.3234	(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	226.3117	199.8546	211.8578	185.4597	179.1519	160.7675	158.3180	165.0700	167.3634	187.3801	200.1080	223.7632	(64)	
Efficiency of water heater	88.6239	88.6180	88.6046	88.5746	88.5096	88.2000	88.2000	88.2000	88.2000	88.5698	88.6093	88.2000	(216)	
Fuel for water heating, kWh/month	255.3618	225.5236	239.1046	209.3826	202.4095	182.2761	179.4989	187.1542	189.7544	211.5620	225.8318	252.4843	(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	9.3344	8.4311	9.3344	9.0333	9.3344	9.0333	9.3344	9.3344	9.0333	9.3344	9.0333	9.3344	(231)	

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Lighting	22.3369	17.9195	16.1345	11.8208	9.1308	7.4599	8.3294	10.8268	14.0630	18.4514	20.8408	22.9577 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												7618.8227 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												88.2000
Water heating fuel used												2560.3439 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)												23.9053 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												109.9053 (231)
Electricity for lighting (calculated in Appendix L)												180.2717 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												10469.3436 (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	7618.8227	0.2100	1599.9528 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2560.3439	0.2100	537.6722 (264)
Space and water heating			2137.6250 (265)
Pumps, fans and electric keep-hot	109.9053	0.1387	15.2452 (267)
Energy for lighting	180.2717	0.1443	26.0188 (268)
Total CO2, kg/year			2178.8890 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			29.2600 (273)

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

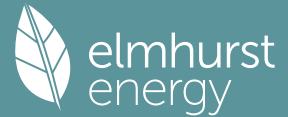
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	7618.8227	1.1300	8609.2696 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2560.3439	1.1300	2893.1886 (278)
Space and water heating			11502.4582 (279)
Pumps, fans and electric keep-hot	109.9053	1.5128	166.2648 (281)
Energy for lighting	180.2717	1.5338	276.5067 (282)
Total Primary energy kWh/year			11945.2297 (286)
Dwelling Primary energy Rate (DPER)			160.4000 (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	74.4700 (1b)	x 2.8600 (2b)	= 212.9842 (1b) -

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 74.4700 (4)
 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 212.9842 (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	3 * 10 =	30.0000	(7a)	
Number of passive vents	0 * 10 =	0.0000	(7b)	
Number of flueless gas fires	0 * 40 =	0.0000	(7c)	
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000	/ (5) =	0.1409	(8)
Pressure test	Yes			
Pressure Test Method	Blower Door			
Measured/design AP50	5.0000 (17)			
Infiltration rate	0.3909 (18)			
Number of sides sheltered	3 (19)			
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3029	(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	0.3862	0.3786	0.3711	0.3332	0.3256	0.2878	0.2878	0.2802	0.3029	0.3256	0.3408	0.3559 (22b)
Effective ac	0.5746	0.5717	0.5688	0.5555	0.5530	0.5414	0.5414	0.5393	0.5459	0.5530	0.5581	0.5633 (25)

3. Heat losses and heat loss parameter

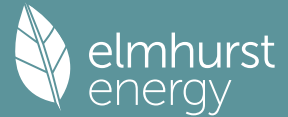
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			16.7000	1.1450	19.1221		(27)
EXPOSED FLOOR SHOP			74.4700	0.1300	9.6811		(28b)
Old External wall	73.2986	16.7000	56.5986	0.1800	10.1877		(29a)
Corridor wall	23.9700	1.8900	22.0800	0.1800	3.9744		(29a)
Total net area of external elements Aum(A, m2)			171.7386				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.8554		(33)
Party Wall 1			22.4200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							8.5869 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 53.4423 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	40.3843	40.1807	39.9812	39.0441	38.8687	38.0525	38.0525	37.9014	38.3669	38.8687	39.2234	39.5943 (38)
Average = Sum(39)m / 12 =	93.8266	93.6230	93.4235	92.4864	92.3111	91.4949	91.4949	91.3437	91.8092	92.3111	92.6658	93.0366 (39)
												92.4856
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2599	1.2572	1.2545	1.2419	1.2396	1.2286	1.2286	1.2266	1.2328	1.2396	1.2443	1.2493 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3496 (42)
Hot water usage for mixer showers												
	63.6145	62.6585	61.2654	58.6000	56.6330	54.4394	53.1925	54.5751	56.0906	58.4459	61.1685	63.3707 (42a)
Hot water usage for baths												
	27.4795	27.0714	26.4967	25.4371	24.6436	23.7638	23.2886	23.8592	24.4806	25.4221	26.5035	27.3866 (42b)
Hot water usage for other uses												
	38.6921	37.2851	35.8781	34.4711	33.0641	31.6572	31.6572	33.0641	34.4711	35.8781	37.2851	38.6921 (42c)
Average daily hot water use (litres/day)												119.3029 (43)
Daily hot water use												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	129.7861	127.0150	123.6402	118.5082	114.3407	109.8603	108.1383	111.4985	115.0424	119.7460	124.9571	129.4495 (44)
Energy content (annual)	205.5494	180.8677	190.0304	162.2318	153.9246	135.0861	130.7839	138.0584	141.8587	162.4942	178.0244	202.6866 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1981.5961

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	30.8324	27.1301	28.5046	24.3348	23.0887	20.2629	19.6176	20.7088	21.2788	24.3741	26.7037	30.4030 (46)
Water storage loss:												
Total storage 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 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	256.5083	226.8950	240.9893	211.5468	204.8835	184.4012	181.7428	189.0173	191.1738	213.4531	227.3394	253.6455 (62)
WWHRS	-29.0819	-25.7203	-26.9328	-22.3014	-20.7841	-17.7851	-16.6707	-17.7276	-18.4012	-21.6929	-24.5755	-28.5433 (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												
	227.4265	201.1748	214.0565	189.2454	184.0994	166.6161	165.0721	171.2897	172.7726	191.7602	202.7640	225.1021 (64)
12Total per year (kWh/year)												2311.3794 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month												
	81.0849	71.6453	75.9248	66.2708	63.9197	57.2449	56.2254	58.6441	59.4968	66.7691	71.5219	80.1330 (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	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.6483	115.8606	104.6483	108.1365	104.6483	108.1365	104.6483	104.6483	108.1365	104.6483	108.1365	104.6483 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.4974	209.6505	204.2246	192.6735	178.0922	164.3879	155.2325	153.0794	158.5053	170.0564	184.6377	198.3420 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833 (71)
Water heating gains (Table 5)	108.9851	106.6151	102.0495	92.0428	85.9135	79.5068	75.5717	78.8228	82.6344	89.7434	99.3359	107.7057 (72)
Total internal gains	482.3745	493.3700	472.1662	454.0966	429.8977	410.2750	393.6963	394.7942	407.5200	425.6918	453.3539	471.9397 (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				4.3200	10.6334	0.6300	0.7000	0.7700	14.0387 (74)			
South				1.3900	46.7521	0.6300	0.7000	0.7700	19.8604 (78)			
West				9.2900	19.6403	0.6300	0.7000	0.7700	55.7616 (80)			
Northwest				1.7000	11.2829	0.6300	0.7000	0.7700	5.8620 (81)			
Solar gains	95.5226	180.3685	288.1607	417.3571	515.9854	531.8461	504.7318	429.3105	333.2197	211.0350	117.7638	79.5073 (83)
Total gains	577.8971	673.7385	760.3269	871.4537	945.8832	942.1211	898.4281	824.1046	740.7397	636.7268	571.1178	551.4470 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.1179	55.2378	55.3557	55.9166	56.0228	56.5226	56.5226	56.6161	56.3291	56.0228	55.8084	55.5860
alpha	4.6745	4.6825	4.6904	4.7278	4.7349	4.7682	4.7682	4.7744	4.7553	4.7349	4.7206	4.7057
util living area	0.9940	0.9871	0.9696	0.9109	0.7834	0.5955	0.4427	0.4996	0.7560	0.9468	0.9879	0.9952 (86)
MIT	19.5994	19.8108	20.1279	20.5395	20.8335	20.9652	20.9931	20.9880	20.8958	20.4941	19.9757	19.5660 (87)
Th 2	19.8724	19.8745	19.8766	19.8866	19.8885	19.8972	19.8972	19.8988	19.8938	19.8885	19.8847	19.8807 (88)
util rest of house	0.9920	0.9829	0.9595	0.8823	0.7224	0.5037	0.3346	0.3852	0.6689	0.9232	0.9832	0.9936 (89)
MIT 2	18.2647	18.5343	18.9338	19.4374	19.7566	19.8788	19.8952	19.8949	19.8275	19.3984	18.7531	18.2280 (90)
Living area fraction	18.6599	18.9123	19.2874	19.7637	20.0755	20.2004	20.2202	20.2186	20.1438	19.7228	19.1151	18.6242 (92)
MIT	18.6599	18.9123	19.2874	19.7637	20.0755	20.2004	20.2202	20.2186	20.1438	19.7228	19.1151	18.6242 (93)
Temperature adjustment												0.0000
adjusted MIT	18.6599	18.9123	19.2874	19.7637	20.0755	20.2004	20.2202	20.2186	20.1438	19.7228	19.1151	18.6242 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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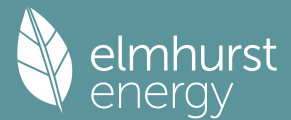
Utilisation	0.9890	0.9780	0.9527	0.8786	0.7336	0.5299	0.3667	0.4192	0.6904	0.9187	0.9787	0.9910 (94)
Useful gains	571.5343	658.9356	724.3789	765.6391	693.8584	499.2079	329.4333	345.4617	511.3854	584.9903	558.9461	546.4713 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1347.3399	1311.8738	1194.6428	1004.7483	773.1471	512.4121	331.2341	348.8023	554.8759	842.1390	1113.3853	1341.9745 (97)
Space heating kWh	577.1993	438.7745	349.8764	172.1586	58.9908	0.0000	0.0000	0.0000	0.0000	191.3186	399.1962	591.8544 (98a)
Space heating requirement - total per year (kWh/year)												2779.3688
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	577.1993	438.7745	349.8764	172.1586	58.9908	0.0000	0.0000	0.0000	0.0000	191.3186	399.1962	591.8544 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2779.3688
Space heating per m2											(98c) / (4) =	37.3220 (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 %)												92.4000 (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	577.1993	438.7745	349.8764	172.1586	58.9908	0.0000	0.0000	0.0000	0.0000	191.3186	399.1962	591.8544 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	624.6746	474.8642	378.6541	186.3189	63.8428	0.0000	0.0000	0.0000	0.0000	207.0548	432.0306	640.5351 (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	227.4265	201.1748	214.0565	189.2454	184.0994	166.6161	165.0721	171.2897	172.7726	191.7602	202.7640	225.1021 (64)
Efficiency of water heater	86.2880	86.0044	85.4272	84.1792	82.2304	80.3000	80.3000	80.3000	80.3000	84.3765	85.8046	86.3518 (216)
Fuel for water heating, kWh/month	263.5669	233.9121	250.5719	224.8127	223.8824	207.4920	205.5692	213.3122	215.1590	227.2673	236.3090	260.6803 (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	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	21.7438	17.4437	15.7061	11.5070	8.8883	7.2618	8.1082	10.5394	13.6896	17.9615	20.2875	22.3482 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-57.6013	-75.7636	-101.7190	-106.6303	-108.9142	-99.6062	-98.3552	-95.6851	-90.2919	-82.7374	-61.3506	-50.4649 (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)	-51.4375	-105.2763	-204.0839	-299.3824	-389.2413	-388.7183	-384.1276	-328.1818	-244.5688	-148.0211	-67.8069	-40.9008 (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												3007.9749 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2762.5349 (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)												175.4853 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3680.8663 (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												2351.1288 (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	3007.9749	0.2100	631.6747 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2762.5349	0.2100	580.1323 (264)
Space and water heating			1211.8071 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	175.4853	0.1443	25.3279 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1029.1197	0.1361	-140.0435
PV Unit electricity exported	-2651.7466	0.1266	-335.7276
Total			-475.7712 (269)
Total CO2, kg/year			773.2931 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3800 (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	3007.9749	1.1300	3399.0116 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2762.5349	1.1300	3121.6645 (278)
Space and water heating			6520.6761 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	175.4853	1.5338	269.1652 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1029.1197	1.5030	-1546.7803
PV Unit electricity exported	-2651.7466	0.4648	-1232.4349
Total			-2779.2152 (283)
Total Primary energy kWh/year			4140.7269 (286)
Target Primary Energy Rate (TPER)			55.6000 (287)

12 Appendix 3 - Conversion - DER/TER Be Green

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Property Reference	S10766 02				Issued on Date	04/08/2023
Assessment Reference	Be Green		Prop Type Ref			
Property						
SAP Rating	86 B	DER	25.56	TER	10.38	
Environmental	79 C	% DER < TER				-146.24
CO ₂ Emissions (t/year)	1.58	DFEE	93.23	TFEE	43.53	
Compliance Check	See BREL	% DFEE < TFEE				-114.15
% DPER < TPER	-144.94	DPER	136.19	TPER	55.60	
Assessor Details	Mr. Peter Kinsella				Assessor ID	L770-0002
Client						

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	74.4700 (1b)	x 2.8600 (2b)	= 212.9842 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.4700		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.9842 (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)

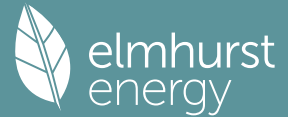
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	No
Measured/design AP50	Blower Door
Infiltration rate	15.0000 (17)
Number of sides sheltered	0.7500 (18)
	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.5813 (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	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830 (22b)
Mechanical extract ventilation - decentralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.9911	0.9766	0.9620	0.8894	0.8748	0.8022	0.8022	0.7877	0.8313	0.8748	0.9039	0.9330 (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
Windows (Uw = 2.60)			21.0000	2.3551	49.4565		(27)
Door			1.8900	1.0000	1.8900		(26)
EXPOSED FLOOR SHOP			74.4700	0.1500	11.1705		(28b)
Old External wall	73.2986	21.0000	52.2986	0.2400	12.5517		(29a)

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Corridor wall	23.9700	1.8900	22.0800	0.1700	3.7536	(29a)
Total net area of external elements Aum(A, m2)			171.7386			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		78.8223	(33)
Party Wall 1			22.4200	0.0000	0.0000	(32)
Party Ceiling 1			74.4700			(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)						34.3477 (36)
Point Thermal bridges					(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =	113.1700 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	69.6588	68.6375	67.6162	62.5095	61.4882	56.3816	56.3816	55.3603	58.4242	61.4882	63.5309	65.5735	(38)
Average = Sum(39)m / 12 =	182.8288	181.8075	180.7862	175.6795	174.6582	169.5516	169.5516	168.5303	171.5942	174.6582	176.7009	178.7435	(39)
												175.4242	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	2.4551	2.4414	2.4276	2.3591	2.3453	2.2768	2.2768	2.2631	2.3042	2.3453	2.3728	2.4002	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3496 (42)
Hot water usage for mixer showers	87.4699	86.1554	84.2399	80.5750	77.8703	74.8541	73.1398	75.0407	77.1246	80.3630	84.1067	87.1348	(42a)
Hot water usage for baths	27.4795	27.0714	26.4967	25.4371	24.6436	23.7638	23.2886	23.8592	24.4806	25.4221	26.5035	27.3866	(42b)
Hot water usage for other uses	38.6921	37.2851	35.8781	34.4711	33.0641	31.6572	31.6572	33.0641	34.4711	35.8781	37.2851	38.6921	(42c)
Average daily hot water use (litres/day)												141.2968	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	153.6415	150.5119	146.6147	140.4832	135.5781	130.2751	128.0855	131.9641	136.0763	141.6632	147.8953	153.2135	(44)
Energy content (annual)	243.3306	214.3270	225.3414	192.3144	182.5142	160.1884	154.9083	163.3992	167.7957	192.2356	210.7040	239.8953	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2346.9541	
Water storage loss:	36.4996	32.1490	33.8012	28.8472	27.3771	24.0283	23.2362	24.5099	25.1694	28.8353	31.6056	35.9843	(46)
Total storage 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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	31.0152	28.0093	31.0008	29.9802	30.9665	29.9545	30.9444	30.9512	29.9605	30.9743	29.9949	31.0124	(61)
Total heat required for water heating calculated for each month	274.3458	242.3363	256.3422	222.2946	213.4807	190.1429	185.8527	194.3504	197.7563	223.2099	240.6989	270.9077	(62)
WWHRS	-48.0341	-42.4817	-44.4844	-36.8348	-34.3288	-29.3754	-27.5347	-29.2804	-30.3929	-35.8299	-40.5909	-47.1445	(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	226.3117	199.8546	211.8578	185.4597	179.1519	160.7675	158.3180	165.0700	167.3634	187.3801	200.1080	223.7632	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2265.4059	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)

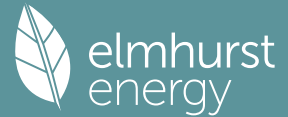
Heat gains from water heating, kWh/month	88.6612	78.2660	82.6762	71.4396	68.4276	60.7513	59.2431	62.0680	63.2822	71.6619	77.5578	87.5183	(65)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	104.6586	115.8720	104.6586	108.1472	104.6586	108.1472	104.6586	104.6586	108.1472	104.6586	108.1472	104.6586	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	207.4974	209.6505	204.2246	192.6735	178.0922	164.3879	155.2325	153.0794	158.5053	170.0564	184.6377	198.3420	(68)
Pumps, fans	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	(71)
Total internal gains	119.1683	116.4673	111.1239	99.2216	91.9726	84.3768	79.6278	83.4248	87.8920	96.3198	107.7192	117.6321	(72)
	492.5680	503.2337	481.2509	461.2861	435.9671	415.1556	397.7627	399.4065	412.7882	432.2786	461.7478	481.8765	(73)

6. Solar gains

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[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	5.4300	10.6334	0.6300	0.7000	0.7700	17.6459 (74)
South	1.7500	46.7521	0.6300	0.7000	0.7700	25.0041 (78)
West	11.6800	19.6403	0.6300	0.7000	0.7700	70.1071 (80)
Northwest	2.1400	11.2829	0.6300	0.7000	0.7700	7.3792 (81)

Solar gains	120.1362	226.8373	362.3850	524.8412	648.8574	668.7979	634.7033	539.8680	419.0436	265.4001	148.1070	99.9952 (83)
Total gains	612.7043	730.0709	843.6359	986.1273	1084.8245	1083.9535	1032.4660	939.2745	831.8319	697.6787	609.8549	581.8717 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	28.2862	28.4451	28.6058	29.4373	29.6094	30.5012	30.5012	30.6860	30.1381	29.6094	29.2671	28.9327
alpha	2.8857	2.8963	2.9071	2.9625	2.9740	3.0334	3.0334	3.0457	3.0092	2.9740	2.9511	2.9288
util living area	0.9922	0.9865	0.9746	0.9422	0.8749	0.7525	0.6201	0.6766	0.8642	0.9634	0.9876	0.9934 (86)
MIT	18.1561	18.4282	18.8990	19.5884	20.2018	20.6781	20.8737	20.8328	20.4468	19.6473	18.8175	18.1569 (87)
Th 2	19.0472	19.0553	19.0635	19.1047	19.1130	19.1552	19.1552	19.1637	19.1382	19.1130	19.0964	19.0799 (88)
util rest of house	0.9892	0.9812	0.9639	0.9155	0.8102	0.6142	0.4016	0.4645	0.7649	0.9412	0.9818	0.9909 (89)
MIT 2	16.6164	16.8910	17.3608	18.0548	18.6215	19.0279	19.1330	19.1285	18.8667	18.1316	17.3058	16.6375 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.0723	17.3462	17.8163	18.5089	19.0894	19.5165	19.6484	19.6331	19.3345	18.5804	17.7534	17.0874 (92)
Temperature adjustment	-0.1500											
adjusted MIT	16.9223	17.1962	17.6663	18.3589	18.9394	19.3665	19.4984	19.4831	19.1845	18.4304	17.6034	16.9374 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9839	0.9733	0.9523	0.9008	0.8025	0.6334	0.4484	0.5084	0.7682	0.9289	0.9745	0.9862 (94)
Useful gains	602.8467	710.5919	803.4365	888.3129	870.5660	686.5786	462.9100	477.5082	638.9985	648.0873	594.3246	573.8658 (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	2307.7162	2235.5360	2018.7074	1661.7363	1264.4280	808.1738	491.4264	519.5959	872.4784	1367.6442	1855.9599	2276.7191 (97)
Space heating kWh	1268.4229	1024.7624	904.1615	556.8648	293.0334	0.0000	0.0000	0.0000	0.0000	535.3503	908.3774	1266.9229 (98a)
Space heating requirement - total per year (kWh/year)	6757.8957											
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	1268.4229	1024.7624	904.1615	556.8648	293.0334	0.0000	0.0000	0.0000	0.0000	535.3503	908.3774	1266.9229 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6757.8957											
Space heating per m2	(98c) / (4) = 90.7466 (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 %)												88.7000 (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	1268.4229	1024.7624	904.1615	556.8648	293.0334	0.0000	0.0000	0.0000	0.0000	535.3503	908.3774	1266.9229 (98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000 (210)
Space heating fuel (main heating system)	1430.0145	1155.3128	1019.3478	627.8070	330.3646	0.0000	0.0000	0.0000	0.0000	603.5517	1024.1008	1428.3234 (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	226.3117	199.8546	211.8578	185.4597	179.1519	160.7675	158.3180	165.0700	167.3634	187.3801	200.1080	223.7632 (64)
Efficiency of water heater	88.6239	88.6180	88.6046	88.5746	88.5096	88.2000	88.2000	88.2000	88.2000	88.5698	88.6093	88.2000 (216)
Fuel for water heating, kWh/month	255.3618	225.5236	239.1046	209.3826	202.4095	182.2761	179.4989	187.1542	189.7544	211.5620	225.8318	252.4843 (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	9.3344	8.4311	9.3344	9.0333	9.3344	9.0333	9.3344	9.3344	9.0333	9.3344	9.0333	9.3344 (231)

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Lighting	22.3369	17.9195	16.1345	11.8208	9.1308	7.4599	8.3294	10.8268	14.0630	18.4514	20.8408	22.9577 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-31.3601	-47.8344	-74.4459	-87.8413	-96.0571	-89.9138	-88.5016	-82.7416	-71.7522	-56.5942	-35.4050	-26.4528 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-16.1498	-38.9215	-91.5189	-158.2962	-226.6256	-234.4714	-228.6167	-182.2972	-118.9086	-59.4204	-22.4627	-12.2614 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												7618.8227 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												88.2000
Water heating fuel used												2560.3439 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)												23.9053 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												109.9053 (231)
Electricity for lighting (calculated in Appendix L)												180.2717 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2178.8502 (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												8290.4934 (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	7618.8227	0.2100	1599.9528 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2560.3439	0.2100	537.6722 (264)
Space and water heating			2137.6250 (265)
Pumps, fans and electric keep-hot	109.9053	0.1387	15.2452 (267)
Energy for lighting	180.2717	0.1443	26.0188 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-788.9000	0.1336	-105.3852
PV Unit electricity exported	-1389.9502	0.1226	-170.3622
Total			-275.7474 (269)
Total CO2, kg/year			1903.1415 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			25.5600 (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	7618.8227	1.1300	8609.2696 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2560.3439	1.1300	2893.1886 (278)
Space and water heating			11502.4582 (279)
Pumps, fans and electric keep-hot	109.9053	1.5128	166.2648 (281)
Energy for lighting	180.2717	1.5338	276.5067 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-788.9000	1.4937	-1178.3491
PV Unit electricity exported	-1389.9502	0.4497	-625.1293
Total			-1803.4784 (283)
Total Primary energy kWh/year			10141.7513 (286)
Dwelling Primary energy Rate (DPER)			136.1900 (287)

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1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.4700 (1b)	x 2.8600 (2b)	= 212.9842 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.4700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 212.9842 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1409 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3909 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3029 (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	0.3862	0.3786	0.3711	0.3332	0.3256	0.2878	0.2878	0.2802	0.3029	0.3256	0.3408	0.3559 (22b)
Effective ac	0.5746	0.5717	0.5688	0.5555	0.5530	0.5414	0.5414	0.5393	0.5459	0.5530	0.5581	0.5633 (25)

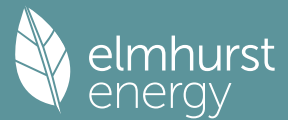
3. Heat losses and heat loss parameter

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			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.20)			16.7000	1.1450	19.1221		(27)					
EXPOSED FLOOR SHOP			74.4700	0.1300	9.6811		(28b)					
Old External wall	73.2986	16.7000	56.5986	0.1800	10.1877		(29a)					
Corridor wall	23.9700	1.8900	22.0800	0.1800	3.9744		(29a)					
Total net area of external elements Aum(A, m2)			171.7386				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.8554		(33)					
Party Wall 1			22.4200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.050 * total exposed area)							8.5869 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	53.4423 (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	40.3843	40.1807	39.9812	39.0441	38.8687	38.0525	38.0525	37.9014	38.3669	38.8687	39.2234	39.5943 (38)
Heat transfer coeff	93.8266	93.6230	93.4235	92.4864	92.3111	91.4949	91.4949	91.3437	91.8092	92.3111	92.6658	93.0366 (39)
Average = Sum(39)m / 12 =												92.4856
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2599	1.2572	1.2545	1.2419	1.2396	1.2286	1.2286	1.2266	1.2328	1.2396	1.2443	1.2493 (40)
HLP (average)												1.2419
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3496 (42)
Hot water usage for mixer showers												
63.6145	62.6585	61.2654	58.6000	56.6330	54.4394	53.1925	54.5751	56.0906	58.4459	61.1685	63.3707 (42a)	
Hot water usage for baths												
27.4795	27.0714	26.4967	25.4371	24.6436	23.7638	23.2886	23.8592	24.4806	25.4221	26.5035	27.3866 (42b)	

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Hot water usage for other uses	38.6921	37.2851	35.8781	34.4711	33.0641	31.6572	31.6572	33.0641	34.4711	35.8781	37.2851	38.6921 (42c)
Average daily hot water use (litres/day)	119.3029 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	129.7861	127.0150	123.6402	118.5082	114.3407	109.8603	108.1383	111.4985	115.0424	119.7460	124.9571	129.4495 (44)
Energy content (annual)	205.5494	180.8677	190.0304	162.2318	153.9246	135.0861	130.7839	138.0584	141.8587	162.4942	178.0244	202.6866 (45)
Distribution loss (46)m = 0.15 x (45)m	1981.5961											
Water storage loss:	30.8324	27.1301	28.5046	24.3348	23.0887	20.2629	19.6176	20.7088	21.2788	24.3741	26.7037	30.4030 (46)
Total storage 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 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	256.5083	226.8950	240.9893	211.5468	204.8835	184.4012	181.7428	189.0173	191.1738	213.4531	227.3394	253.6455 (62)
WWHRS	-29.0819	-25.7203	-26.9328	-22.3014	-20.7841	-17.7851	-16.6707	-17.7276	-18.4012	-21.6929	-24.5755	-28.5433 (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	227.4265	201.1748	214.0565	189.2454	184.0994	166.6161	165.0721	171.2897	172.7726	191.7602	202.7640	225.1021 (64)
12Total per year (kWh/year)	2311.3794 (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	81.0849	71.6453	75.9248	66.2708	63.9197	57.2449	56.2254	58.6441	59.4968	66.7691	71.5219	80.1330 (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	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792	117.4792 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.6483	115.8606	104.6483	108.1365	104.6483	108.1365	104.6483	104.6483	108.1365	104.6483	108.1365	104.6483 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.4974	209.6505	204.2246	192.6735	178.0922	164.3879	155.2325	153.0794	158.5053	170.0564	184.6377	198.3420 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479	34.7479 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833	-93.9833 (71)
Water heating gains (Table 5)	108.9851	106.6151	102.0495	92.0428	85.9135	79.5068	75.5717	78.8228	82.6344	89.7434	99.3359	107.7057 (72)
Total internal gains	482.3745	493.3700	472.1662	454.0966	429.8977	410.2750	393.6963	394.7942	407.5200	425.6918	453.3539	471.9397 (73)

6. Solar gains

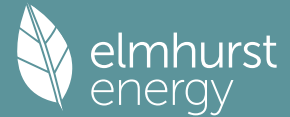
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	4.3200	10.6334	0.6300	0.7000	0.7700	14.0387 (74)
South	1.3900	46.7521	0.6300	0.7000	0.7700	19.8604 (78)
West	9.2900	19.6403	0.6300	0.7000	0.7700	55.7616 (80)
Northwest	1.7000	11.2829	0.6300	0.7000	0.7700	5.8620 (81)

Solar gains	95.5226	180.3685	288.1607	417.3571	515.9854	531.8461	504.7318	429.3105	333.2197	211.0350	117.7638	79.5073 (83)
Total gains	577.8971	673.7385	760.3269	871.4537	945.8832	942.1211	898.4281	824.1046	740.7397	636.7268	571.1178	551.4470 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.1179	55.2378	55.3557	55.9166	56.0228	56.5226	56.5226	56.6161	56.3291	56.0228	55.8084	55.5860
alpha	4.6745	4.6825	4.6904	4.7278	4.7349	4.7682	4.7682	4.7744	4.7553	4.7349	4.7206	4.7057
util living area	0.9940	0.9871	0.9696	0.9109	0.7834	0.5955	0.4427	0.4996	0.7560	0.9468	0.9879	0.9952 (86)
MIT	19.5994	19.8108	20.1279	20.5395	20.8335	20.9652	20.9931	20.9880	20.8958	20.4941	19.9757	19.5660 (87)
Th 2	19.8724	19.8745	19.8766	19.8866	19.8885	19.8972	19.8972	19.8988	19.8938	19.8885	19.8847	19.8807 (88)
util rest of house	0.9920	0.9829	0.9595	0.8823	0.7224	0.5037	0.3346	0.3852	0.6689	0.9232	0.9832	0.9936 (89)
MIT 2	18.2647	18.5343	18.9338	19.4374	19.7566	19.8788	19.8952	19.8949	19.8275	19.3984	18.7531	18.2280 (90)
Living area fraction	fLA = Living area / (4) =											0.2961 (91)
MIT	18.6599	18.9123	19.2874	19.7637	20.0755	20.2004	20.2202	20.2186	20.1438	19.7228	19.1151	18.6242 (92)

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Temperature adjustment adjusted MIT	18.6599	18.9123	19.2874	19.7637	20.0755	20.2004	20.2202	20.2186	20.1438	19.7228	19.1151	0.0000 18.6242 (93)

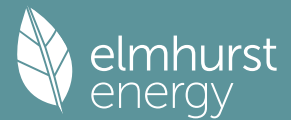
8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9890	0.9780	0.9527	0.8786	0.7336	0.5299	0.3667	0.4192	0.6904	0.9187	0.9787	0.9910 (94)
Useful gains	571.5343	658.9356	724.3789	765.6391	693.8584	499.2079	329.4333	345.4617	511.3854	584.9903	558.9461	546.4713 (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	1347.3399	1311.8738	1194.6428	1004.7483	773.1471	512.4121	331.2341	348.8023	554.8759	842.1390	1113.3853	1341.9745 (97)
Space heating kWh	577.1993	438.7745	349.8764	172.1586	58.9908	0.0000	0.0000	0.0000	0.0000	191.3186	399.1962	591.8544 (98a)
Space heating requirement - total per year (kWh/year)												2779.3688
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	577.1993	438.7745	349.8764	172.1586	58.9908	0.0000	0.0000	0.0000	0.0000	191.3186	399.1962	591.8544 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2779.3688
Space heating per m2										(98c) / (4) =		37.3220 (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 %)												92.4000 (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	577.1993	438.7745	349.8764	172.1586	58.9908	0.0000	0.0000	0.0000	0.0000	191.3186	399.1962	591.8544 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	624.6746	474.8642	378.6541	186.3189	63.8428	0.0000	0.0000	0.0000	0.0000	207.0548	432.0306	640.5351 (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	227.4265	201.1748	214.0565	189.2454	184.0994	166.6161	165.0721	171.2897	172.7726	191.7602	202.7640	225.1021 (64)
Efficiency of water heater (217)m	86.2880	86.0044	85.4272	84.1792	82.2304	80.3000	80.3000	80.3000	80.3000	84.3765	85.8046	80.3000 (216)
Fuel for water heating, kWh/month	263.5669	233.9121	250.5719	224.8127	223.8824	207.4920	205.5692	213.3122	215.1590	227.2673	236.3090	260.6803 (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	21.7438	17.4437	15.7061	11.5070	8.8883	7.2618	8.1082	10.5394	13.6896	17.9615	20.2875	22.3482 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-57.6013	-75.7636	-101.7190	-106.6303	-108.9142	-99.6062	-98.3552	-95.6851	-90.2919	-82.7374	-61.3506	-50.4649 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-51.4375	-105.2763	-204.0839	-299.3824	-389.2413	-388.7183	-384.1276	-328.1818	-244.5688	-148.0211	-67.8069	-40.9008 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3007.9749 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2762.5349 (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)												175.4853 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3680.8663 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2351.1288 (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	3007.9749	0.2100	631.6747 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2762.5349	0.2100	580.1323 (264)
Space and water heating			1211.8071 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	175.4853	0.1443	25.3279 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1029.1197	0.1361	-140.0435
PV Unit electricity exported	-2651.7466	0.1266	-335.7276
Total			-475.7712 (269)
Total CO2, kg/year			773.2931 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3800 (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	3007.9749	1.1300	3399.0116 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2762.5349	1.1300	3121.6645 (278)
Space and water heating			6520.6761 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	175.4853	1.5338	269.1652 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1029.1197	1.5030	-1546.7803
PV Unit electricity exported	-2651.7466	0.4648	-1232.4349
Total			-2779.2152 (283)
Total Primary energy kWh/year			4140.7269 (286)
Target Primary Energy Rate (TPER)			55.6000 (287)

13 Appendix 4 - New Build - DER/TER Be Lean

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Property Reference	S10766 01				Issued on Date	04/08/2023	
Assessment Reference	Be Lean ASHP			Prop Type Ref			
Property							
SAP Rating	76 C		DER	6.75		TER	14.32
Environmental	95 A		% DER < TER				52.86
CO ₂ Emissions (t/year)	0.35		DFEE	42.41		TFEE	46.28
Compliance Check	See BREL		% DFEE < TFEE				8.36
% DPER < TPER	5.81		DPER	70.89		TPER	75.27
Assessor Details	Mr. Peter Kinsella					Assessor ID	L770-0002
Client							

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	56.8300 (1b)	x 2.8800 (2b)	= 163.6704 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.8300		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 163.6704 (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)

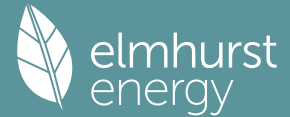
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	3.0000 (17)
Number of sides sheltered	0.1500 (18)
	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (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
Windows (Uw = 1.20)			10.1500	1.1450	11.6221		(27)
Door			3.6700	1.0000	3.6700		(26)
Heat Loss Floor 1			56.8300	0.1000	5.6830		(28a)
External wall	75.5100	13.8200	61.6900	0.1500	9.2535		(29a)

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Corridor wall	15.1800	15.1800	0.1700	2.5806	(29a)
Commercial wall	4.8700	4.8700	0.1800	0.8766	(29a)
ceiling below corridor	2.1000	2.1000	0.1200	0.2520	(30)
External Roof 2	4.2300	4.2300	0.1200	0.5076	(30)
Total net area of external elements Aum(A, m2)		158.7200			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	34.4454		(33)
Party Ceiling 1		50.5100			(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	7.9360	(36)
Point Thermal bridges	0.0000	(36a) =
Total fabric heat loss	(33) + (36) + (36a) =	42.3814 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	(38)
Average = Sum(39)m / 12 =	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	(39)
HLP	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	(40)
HLP (average)												1.2210	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

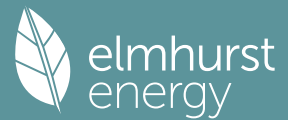
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.8907 (42)
Hot water usage for mixer showers	98.7061	97.2227	95.0611	90.9254	87.8734	84.4697	82.5351	84.6803	87.0318	90.6863	94.9108	98.3279	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	33.9931	32.7570	31.5209	30.2847	29.0486	27.8125	27.8125	29.0486	30.2847	31.5209	32.7570	33.9931	(42c)
Average daily hot water use (litres/day)												121.9065	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	132.6991	129.9797	126.5820	121.2102	116.9220	112.2822	110.3476	113.7289	117.3165	122.2071	127.6678	132.3210	(44)
Energy content (annual)	210.1630	185.0893	194.5518	165.9307	157.3995	138.0641	133.4559	140.8202	144.6630	165.8339	181.8862	207.1826	(45)
Distribution loss (46)m = 0.15 x (45)m	31.5244	27.7634	29.1828	24.8896	23.6099	20.7096	20.0184	21.1230	21.6995	24.8751	27.2829	31.0774	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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	264.5618	234.2237	248.9506	218.5747	211.7983	190.7081	187.8547	195.2190	197.3070	220.2327	234.5302	261.5814	(62)
WWHRS	-54.2044	-47.9388	-50.1988	-41.5666	-38.7385	-33.1488	-31.0718	-33.0417	-34.2971	-40.4325	-45.8051	-53.2006	(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	210.3574	186.2849	198.7519	177.0081	173.0597	157.5593	156.7829	162.1773	163.0100	179.8003	188.7251	208.3808	(64)
12Total per year (kWh/year)													2161.8976 (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	113.3982	100.8497	108.2075	97.2871	95.8544	88.0215	87.8931	90.3417	90.2157	98.6588	102.5924	112.4073	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	85.0497	94.1622	85.0497	87.8847	85.0497	87.8847	85.0497	85.0497	87.8847	85.0497	87.8847	85.0497	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	164.8875	166.5985	162.2868	153.1077	141.5207	130.6306	123.3553	121.6443	125.9560	135.1351	146.7221	157.6122	(68)
Pumps, fans	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	(69)
Losses e.g. evaporation (negative values) (Table 5)	9.8202	9.8202	9.8202	9.8202	9.8202	0.0000	0.0000	0.0000	0.0000	9.8202	9.8202	9.8202	(70)
Water heating gains (Table 5)	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	(71)
Total internal gains	152.4170	150.0740	145.4402	135.1210	128.8365	122.2521	118.1359	121.4271	125.2995	132.6059	142.4894	151.0850	(72)
	463.5355	472.0160	453.9581	437.2948	416.5883	392.1285	377.9021	379.4822	390.5013	413.9721	438.2775	454.9283	(73)

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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
South				3.8000	46.7521	0.6300	0.7000	0.7700	54.2945 (78)
West				6.3500	19.6403	0.6300	0.7000	0.7700	38.1147 (80)
Solar gains	92.4093	163.4810	236.0594	307.1011	352.8757	353.0516	339.3316	261.1332	78.2592 (83)
Total gains	555.9448	635.4970	690.0175	744.3959	769.4640	745.1801	717.2337	598.3535	533.1875 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770
alpha	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918
util living area	0.9844	0.9700	0.9419	0.8731	0.7475	0.5747	0.4216	0.4595	0.6813	0.8948	0.9697	0.9871 (86)
MIT	19.8612	20.0676	20.3367	20.6468	20.8694	20.9706	20.9945	20.9917	20.9351	20.6533	20.1974	19.8093 (87)
Th 2	20.3895	20.3895	20.3895	20.3895	20.3895	20.3895	20.3895	20.3895	20.3895	20.3895	20.3895	20.3895 (88)
util rest of house	0.9819	0.9654	0.9330	0.8544	0.7139	0.5259	0.3647	0.4009	0.6338	0.8753	0.9642	0.9850 (89)
MIT 2	19.3271	19.5305	19.7937	20.0893	20.2897	20.3712	20.3870	20.3855	20.3459	20.0999	19.6602	19.2757 (90)
Living area fraction	fLA = Living area / (4) =											0.5126 (91)
MIT	19.6009	19.8058	20.0721	20.3751	20.5869	20.6784	20.6984	20.6962	20.6479	20.3836	19.9356	19.5492 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6009	19.8058	20.0721	20.3751	20.5869	20.6784	20.6984	20.6962	20.6479	20.3836	19.9356	19.5492 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9780	0.9603	0.9279	0.8540	0.7251	0.5493	0.3936	0.4306	0.6544	0.8751	0.9595	0.9815 (94)
Useful gains	543.7265	610.2443	640.2442	635.6803	557.9728	409.3329	282.3267	294.9535	426.4547	523.6284	527.8790	523.3380 (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	1061.6836	1034.2702	941.7247	796.2232	616.6331	421.7621	284.3752	298.1036	454.3424	678.8526	890.6214	1065.0349 (97)
Space heating kWh	385.3601	284.9454	224.3015	115.5909	43.6433	0.0000	0.0000	0.0000	0.0000	115.4868	261.1745	403.0225 (98a)
Space heating requirement - total per year (kWh/year)												1833.5249
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	385.3601	284.9454	224.3015	115.5909	43.6433	0.0000	0.0000	0.0000	0.0000	115.4868	261.1745	403.0225 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1833.5249
Space heating per m2										(98c) / (4) =		32.2633 (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 %)												170.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	385.3601	284.9454	224.3015	115.5909	43.6433	0.0000	0.0000	0.0000	0.0000	115.4868	261.1745	403.0225 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	226.6824	167.6149	131.9420	67.9946	25.6725	0.0000	0.0000	0.0000	0.0000	67.9334	153.6321	237.0721 (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	210.3574	186.2849	198.7519	177.0081	173.0597	157.5593	156.7829	162.1773	163.0100	179.8003	188.7251	208.3808 (64)
Efficiency of water heater												170.0000 (216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (217)
Fuel for water heating, kWh/month												

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	123.7396	109.5793	116.9129	104.1224	101.7998	92.6819	92.2252	95.3984	95.8882	105.7649	111.0148	122.5770 (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	9.9007	8.9426	9.9007	9.5813	9.9007	9.5813	9.9007	9.9007	9.5813	9.9007	9.5813	9.9007 (231)
Lighting	17.6717	14.1769	12.7647	9.3520	7.2237	5.9018	6.5897	8.5656	11.1258	14.5977	16.4880	18.1628 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1078.5441 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.0000
Water heating fuel used												1271.7044 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDcentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)												18.3704 (230a)
warm air heating system fans												98.2022 (230b)
Total electricity for the above, kWh/year												116.5726 (231)
Electricity for lighting (calculated in Appendix L)												142.6203 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												2609.4415 (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	1078.5441	0.1559	168.1469 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1271.7044	0.1406	178.7861 (264)
Space and water heating			346.9330 (265)
Pumps, fans and electric keep-hot	116.5726	0.1387	16.1701 (267)
Energy for lighting	142.6203	0.1443	20.5845 (268)
Total CO2, kg/year			383.6876 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.7500 (273)

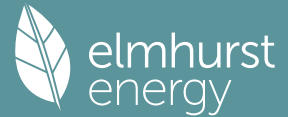
13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1078.5441	1.5772	1701.0419 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1271.7044	1.5198	1932.7708 (278)
Space and water heating			3633.8127 (279)
Pumps, fans and electric keep-hot	116.5726	1.5128	176.3510 (281)
Energy for lighting	142.6203	1.5338	218.7558 (282)
Total Primary energy kWh/year			4028.9196 (286)
Dwelling Primary energy Rate (DPER)			70.8900 (287)

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

1. Overall dwelling characteristics

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Ground floor	Area (m2)	Storey height (m)	Volume (m3)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.8300 (1b)	x 2.8800 (2b)	= 163.6704 (1b) - (4)
Dwelling volume	(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		163.6704 (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	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1222	(8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	5.0000 (17)		
Infiltration rate	0.3722 (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) =	0.3164	(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	0.4034	0.3955	0.3875	0.3480	0.3401	0.3005	0.3005	0.2926	0.3164	0.3401	0.3559	0.3717 (22b)
Effective ac	0.5814	0.5782	0.5751	0.5606	0.5578	0.5452	0.5452	0.5428	0.5500	0.5578	0.5633	0.5691 (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			3.6700	1.0000	3.6700		(26)
TER Opening Type (Uw = 1.20)			10.1500	1.1450	11.6221		(27)
Heat Loss Floor 1			56.8300	0.1300	7.3879		(28a)
External wall	75.5100	13.8200	61.6900	0.1800	11.1042		(29a)
Corridor wall	15.1800		15.1800	0.1800	2.7324		(29a)
Commercial wall	4.8700		4.8700	0.1800	0.8766		(29a)
ceiling below corridor	2.1000		2.1000	0.1100	0.2310		(30)
External Roof 2	4.2300		4.2300	0.1100	0.4653		(30)
Total net area of external elements Aum(A, m2)			158.7200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	38.0895	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E5 Ground floor (normal)				34.2200	0.1600	5.4752	
E16 Corner (normal)				11.5200	0.0900	1.0368	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5120 (36)
Point Thermal bridges							0.0000
Total fabric heat loss	(33) + (36) + (36a) =						44.6015 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.3996	Feb 31.2290	Mar 31.0617	Apr 30.2762	May 30.1292	Jun 29.4450	Jul 29.4450	Aug 29.3183	Sep 29.7086	Oct 30.1292	Nov 30.4265	Dec 30.7374 (38)
Heat transfer coeff	76.0011	75.8305	75.6633	74.8777	74.7307	74.0466	74.0466	73.9199	74.3101	74.7307	75.0281	75.3389 (39)
Average = Sum(39)m / 12 =	74.8770											74.8770
HLP	Jan 1.3373	Feb 1.3343	Mar 1.3314	Apr 1.3176	May 1.3150	Jun 1.3029	Jul 1.3029	Aug 1.3007	Sep 1.3076	Oct 1.3150	Nov 1.3202	Dec 1.3257 (40)
HLP (average)	1.3176											1.3176
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8907 (42)											
Hot water usage for mixer showers												
	71.7862	70.7074	69.1354	66.1276	63.9079	61.4325	60.0255	61.5857	63.2959	65.9537	69.0261	71.5112 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												

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Average daily hot water use (litres/day)	33.9931	32.7570	31.5209	30.2847	29.0486	27.8125	27.8125	29.0486	30.2847	31.5209	32.7570	33.9931 (42c)
												97.0873 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	105.7793	103.4644	100.6562	96.4123	92.9565	89.2450	87.8380	90.6343	93.5806	97.4745	101.7830	105.5043 (44)
Energy content (annual)	167.5286	147.3319	154.7049	131.9836	125.1374	109.7372	106.2325	112.2242	115.3942	132.2720	145.0086	165.1942 (45)
Distribution loss (46)m = 0.15 x (45)m	25.1293	22.0998	23.2057	19.7975	18.7706	16.4606	15.9349	16.8336	17.3091	19.8408	21.7513	24.7791 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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	214.1235	189.4176	201.2998	177.0755	171.7323	154.8290	152.8274	158.8191	160.4861	178.8669	190.1004	211.7891 (62)
WWHRS	-32.8177	-29.0242	-30.3925	-25.1662	-23.4540	-20.0697	-18.8122	-20.0049	-20.7649	-24.4795	-27.7324	-32.2099 (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	181.3058	160.3934	170.9073	151.9093	148.2783	134.7593	134.0152	138.8142	139.7212	154.3873	162.3681	179.5791 (64)
12Total per year (kWh/year)												1856.4386 (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	92.9792	82.6564	88.7153	79.9580	78.8841	72.5611	72.5982	74.5905	74.4421	81.2564	84.2888	92.2030 (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	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.0497	94.1622	85.0497	87.8847	85.0497	87.8847	85.0497	85.0497	87.8847	85.0497	87.8847	85.0497 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	164.8875	166.5985	162.2868	153.1077	141.5207	130.6306	123.3553	121.6443	125.9560	135.1351	146.7221	157.6122 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537 (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)	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296 (71)
Water heating gains (Table 5)	124.9720	123.0006	119.2410	111.0528	106.0270	100.7793	97.5783	100.2560	103.3917	109.2155	117.0678	123.9287 (72)
Total internal gains	429.2703	438.1224	420.9386	406.4063	386.9585	370.6557	357.3444	358.3111	368.5936	383.7615	406.0357	420.9518 (73)

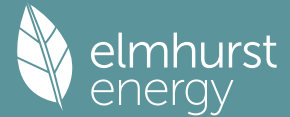
6. Solar gains

[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
South				3.8000	46.7521		0.6300		0.7000		0.7700		54.2945 (78)
West				6.3500	19.6403		0.6300		0.7000		0.7700		38.1147 (80)
Solar gains	92.4093	163.4810	236.0594	307.1011	352.8757	353.0516	339.3316	305.5491	261.1332	184.3814	111.8821		78.2592 (83)
Total gains	521.6796	601.6034	656.9981	713.5075	739.8342	723.7073	696.6760	663.8602	629.7268	568.1429	517.9179		499.2110 (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, n11,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	51.9272	52.0441	52.1591	52.7063	52.8100	53.2979	53.2979	53.3893	53.1089	52.8100	52.6007	52.3837
alpha	4.4618	4.4696	4.4773	4.5138	4.5207	4.5532	4.5532	4.5593	4.5406	4.5207	4.5067	4.4922
util living area	0.9888	0.9781	0.9570	0.9013	0.7924	0.6185	0.4597	0.5001	0.7267	0.9207	0.9781	0.9907 (86)
MIT	19.6258	19.8458	20.1448	20.5187	20.8008	20.9517	20.9899	20.9852	20.8989	20.5346	20.0187	19.5905 (87)
Th 2	19.8117	19.8140	19.8163	19.8271	19.8291	19.8385	19.8385	19.8403	19.8349	19.8291	19.8250	19.8208 (88)
util rest of house	0.9852	0.9712	0.9433	0.8699	0.7302	0.5210	0.3424	0.3801	0.6348	0.8884	0.9699	0.9877 (89)
MIT 2	18.2553	18.5339	18.9076	19.3631	19.6711	19.8130	19.8356	19.8356	19.7727	19.3944	18.7629	18.2170 (90)
Living area fraction									fLA = Living area / (4) =			0.5126 (91)

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MIT	18.9578	19.2063	19.5418	19.9554	20.2502	20.3967	20.4273	20.4249	20.3500	19.9789	19.4066	18.9210 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9578	19.2063	19.5418	19.9554	20.2502	20.3967	20.4273	20.4249	20.3500	19.9789	19.4066	18.9210 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9817	0.9667	0.9394	0.8737	0.7542	0.5694	0.4027	0.4417	0.6779	0.8932	0.9662	0.9846	(94)
Useful gains	512.1313	581.5939	617.1745	623.4255	558.0156	412.0954	280.5780	293.2408	426.8940	507.4570	500.3978	491.5079	(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	1114.0071	1084.8571	986.7827	827.8045	638.9613	429.2234	283.3958	297.5181	464.4374	700.8910	923.3434	1109.0669	(97)
Space heating kWh	447.7956	338.1928	274.9885	147.1529	60.2236	0.0000	0.0000	0.0000	0.0000	143.9148	304.5209	459.4639	(98a)
Space heating requirement - total per year (kWh/year)												2176.2529	
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	447.7956	338.1928	274.9885	147.1529	60.2236	0.0000	0.0000	0.0000	0.0000	143.9148	304.5209	459.4639	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2176.2529	
Space heating per m2										(98c) / (4) =		38.2941	(99)

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

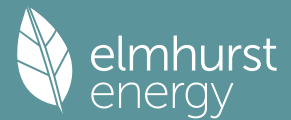
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (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	447.7956	338.1928	274.9885	147.1529	60.2236	0.0000	0.0000	0.0000	0.0000	143.9148	304.5209	459.4639	(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)	485.1523	366.4061	297.9290	159.4289	65.2476	0.0000	0.0000	0.0000	0.0000	155.9207	329.9251	497.7940	(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	181.3058	160.3934	170.9073	151.9093	148.2783	134.7593	134.0152	138.8142	139.7212	154.3873	162.3681	179.5791	(64)
Efficiency of water heater	86.0045	85.6910	85.1204	83.9885	82.2065	79.8000	79.8000	79.8000	79.8000	83.9025	85.4486	79.8000	(216)
Fuel for water heating, kWh/month	210.8095	187.1765	200.7830	180.8692	180.3729	168.8713	167.9389	173.9527	175.0892	184.0079	190.0185	208.6380	(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	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	17.6717	14.1769	12.7647	9.3520	7.2237	5.9018	6.5897	8.5656	11.1258	14.5977	16.4880	18.1628	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-26.9490	-38.1827	-55.1731	-62.4012	-67.6381	-63.3027	-62.5597	-58.9068	-52.4832	-43.8648	-29.7094	-23.2800	(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)	-14.6561	-30.8955	-61.5100	-92.5183	-122.4396	-123.0239	-121.5379	-102.8251	-75.2873	-44.1841	-19.5723	-11.5818	(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												2357.8038	(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												2228.5276	(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)												142.6203	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1404.4826	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)

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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	3410.4692 (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	2357.8038	0.2100	495.1388 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2228.5276	0.2100	467.9908 (264)
Space and water heating			963.1296 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	142.6203	0.1443	20.5845 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-584.4507	0.1345	-78.5823
PV Unit electricity exported	-820.0319	0.1259	-103.2101
Total			-181.7924 (269)
Total CO2, kg/year			813.8510 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.3200 (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	2357.8038	1.1300	2664.3183 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2228.5276	1.1300	2518.2362 (278)
Space and water heating			5182.5545 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	142.6203	1.5338	218.7558 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-584.4507	1.4969	-874.8733
PV Unit electricity exported	-820.0319	0.4620	-378.8513
Total			-1253.7246 (283)
Total Primary energy kWh/year			4277.6865 (286)
Target Primary Energy Rate (TPER)			75.2700 (287)

14 Appendix 5 - New Build - Be Green DER/TER

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Property Reference	S10766 01	Issued on Date	04/08/2023
Assessment Reference	Be Green ASHP	Prop Type Ref	
Property			
SAP Rating	94 A	DER	0.59
Environmental	100 A	TER	14.32
CO ₂ Emissions (t/year)	0	% DER < TER	95.88
Compliance Check	See BREL	DFEE	42.41
% DPER < TPER	71.31	TFEE	46.28
		% DFEE < TFEE	8.36
		DFEE	21.60
		TPER	75.27
Assessor Details	Mr. Peter Kinsella	Assessor ID	L770-0002
Client			

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	56.8300 (1b)	x 2.8800 (2b)	= 163.6704 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.8300		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 163.6704 (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)

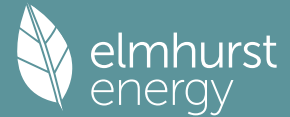
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	3.0000 (17)
Number of sides sheltered	0.1500 (18)
	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (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
Windows (Uw = 1.20)			10.1500	1.1450	11.6221		(27)
Door			3.6700	1.0000	3.6700		(26)
Heat Loss Floor 1			56.8300	0.1000	5.6830		(28a)
External wall	75.5100	13.8200	61.6900	0.1500	9.2535		(29a)

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Corridor wall	15.1800	15.1800	0.1700	2.5806	(29a)
Commercial wall	4.8700	4.8700	0.1800	0.8766	(29a)
ceiling below corridor	2.1000	2.1000	0.1200	0.2520	(30)
External Roof 2	4.2300	4.2300	0.1200	0.5076	(30)
Total net area of external elements Aum(A, m2)		158.7200			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		34.4454	(33)
Party Ceiling 1		50.5100			(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)					7.9360 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss				(33) + (36) + (36a) =	42.3814 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	27.0056	(38)
Average = Sum(39)m / 12 =	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	69.3871	(39)
HLP	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	1.2210	(40)
HLP (average)												1.2210	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.8907 (42)
Hot water usage for mixer showers													
Hot water usage for baths	98.7061	97.2227	95.0611	90.9254	87.8734	84.4697	82.5351	84.6803	87.0318	90.6863	94.9108	98.3279	(42a)
Hot water usage for other uses	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Average daily hot water use (litres/day)	33.9931	32.7570	31.5209	30.2847	29.0486	27.8125	27.8125	29.0486	30.2847	31.5209	32.7570	33.9931	(42c)
												121.9065	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	132.6991	129.9797	126.5820	121.2102	116.9220	112.2822	110.3476	113.7289	117.3165	122.2071	127.6678	132.3210	(44)
Energy content (annual)	210.1630	185.0893	194.5518	165.9307	157.3995	138.0641	133.4559	140.8202	144.6630	165.8339	181.8862	207.1826	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	31.5244	27.7634	29.1828	24.8896	23.6099	20.7096	20.0184	21.1230	21.6995	24.8751	27.2829	31.0774	(46)
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8600 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0044 (55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage													
Primary loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
Combi 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)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
WWHRS	264.5618	234.2237	248.9506	218.5747	211.7983	190.7081	187.8547	195.2190	197.3070	220.2327	234.5302	261.5814	(62)
PV diverter	-54.2044	-47.9388	-50.1988	-41.5666	-38.7385	-33.1488	-31.0718	-33.0417	-34.2971	-40.4325	-45.8051	-53.2006	(63a)
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	(63b)
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	(63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
12Total per year (kWh/year)	210.3574	186.2849	198.7519	177.0081	173.0597	157.5593	156.7829	162.1773	163.0100	179.8003	188.7251	208.3808	(64)
Electric shower(s)													
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
	113.3982	100.8497	108.2075	97.2871	95.8544	88.0215	87.8931	90.3417	90.2157	98.6588	102.5924	112.4073	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	85.0497	94.1622	85.0497	87.8847	85.0497	87.8847	85.0497	85.0497	87.8847	85.0497	87.8847	85.0497	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	164.8875	166.5985	162.2868	153.1077	141.5207	130.6306	123.3553	121.6443	125.9560	135.1351	146.7221	157.6122	(68)
Pumps, fans	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	(71)
Total internal gains	152.4170	150.0740	145.4402	135.1210	128.8365	122.2521	118.1359	121.4271	125.2995	132.6059	142.4894	151.0850	(72)
	453.7153	462.1958	444.1378	427.4745	406.7680	392.1285	377.9021	379.4822	390.5013	404.1519	428.4573	445.1081	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
South				3.8000	46.7521	0.6300	0.7000		0.7700	54.2945 (78)
West				6.3500	19.6403	0.6300	0.7000		0.7700	38.1147 (80)
Solar gains	92.4093	163.4810	236.0594	307.1011	352.8757	353.0516	339.3316	261.1332	184.3814	78.2592 (83)
Total gains	546.1246	625.6768	680.1973	734.5757	759.6437	745.1801	717.2337	651.6346	588.5333	523.3673 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770	56.8770
alpha	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918	4.7918
util living area	0.9854	0.9717	0.9446	0.8776	0.7537	0.5747	0.4216	0.4595	0.6813	0.8998	0.9716	0.9880 (86)
Living	19.8443	20.0518	20.3229	20.6371	20.8646	20.9706	20.9945	20.9917	20.9351	20.6423	20.1816	19.7922
Non living	18.8848	19.0870	19.3472	19.6345	19.8212	19.8913	19.9020	19.9012	19.8729	19.6472	19.2166	18.8335
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	20.4088	20.0518	20.3229	20.6371	20.8646	20.9706	20.9945	20.9917	20.9351	20.6423	20.1816	19.9611 (87)
Th 2	19.9033	19.9033	19.9033	19.9033	19.9033	19.9033	19.9033	19.9033	19.9033	19.9033	19.9033	19.9033 (88)
util rest of house	0.9810	0.9633	0.9283	0.8429	0.6913	0.4852	0.3186	0.3532	0.5929	0.8632	0.9617	0.9843 (89)
MIT 2	19.3822	19.0870	19.3472	19.6345	19.8212	19.8913	19.9020	19.9012	19.8729	19.6472	19.2166	18.9832 (90)
Living area fraction	19.9084	19.5815	19.8474	20.1484	20.3560	20.4445	20.4620	20.4602	20.4174	20.1573	19.7112	0.5126 (91)
MIT	19.9084	19.5815	19.8474	20.1484	20.3560	20.4445	20.4620	20.4602	20.4174	20.1573	19.7112	19.4844 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9084	19.5815	19.8474	20.1484	20.3560	20.4445	20.4620	20.4602	20.4174	20.1573	19.7112	19.4844 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9810	0.9603	0.9273	0.8514	0.7184	0.5304	0.3715	0.4078	0.6361	0.8728	0.9596	0.9825 (94)
Useful gains	535.7484	600.8509	630.7612	625.4396	545.7401	395.2135	266.4691	279.3636	414.4790	513.6494	518.4860	514.2267 (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	1083.0236	1018.7088	926.1338	780.4942	600.6153	405.5322	267.9742	281.7251	438.3429	663.1536	875.0568	1060.5417 (97)
Space heating kWh	407.1727	280.8005	219.7572	111.6394	40.8271	0.0000	0.0000	0.0000	0.0000	111.2312	256.7310	406.4584 (98a)
Space heating requirement - total per year (kWh/year)												1834.6175
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	407.1727	280.8005	219.7572	111.6394	40.8271	0.0000	0.0000	0.0000	0.0000	111.2312	256.7310	406.4584 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1834.6175
Space heating per m2										(98c) / (4) =		32.2826 (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 %)												288.9117 (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	407.1727	280.8005	219.7572	111.6394	40.8271	0.0000	0.0000	0.0000	0.0000	111.2312	256.7310	406.4584 (98)
Space heating efficiency (main heating system 1)	288.9117	288.9117	288.9117	288.9117	288.9117	0.0000	0.0000	0.0000	0.0000	288.9117	288.9117	288.9117 (210)
Space heating fuel (main heating system)	140.9333	97.1925	76.0638	38.6413	14.1313	0.0000	0.0000	0.0000	0.0000	38.5001	88.8614	140.6860 (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

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Water heating requirement	210.3574	186.2849	198.7519	177.0081	173.0597	157.5593	156.7829	162.1773	163.0100	179.8003	188.7251	208.3808 (64)
Efficiency of water heater	190.9295	190.9295	190.9295	190.9295	190.9295	190.9295	190.9295	190.9295	190.9295	190.9295	190.9295	190.9295 (216)
Fuel for water heating, kWh/month	110.1754	97.5674	104.0970	92.7086	90.6406	82.5222	82.1156	84.9409	85.3770	94.1710	98.8454	109.1402 (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	1.5602	1.4092	1.5602	1.5099	1.5602	1.5099	1.5602	1.5602	1.5099	1.5602	1.5099	1.5602 (231)
Lighting	17.6717	14.1769	12.7647	9.3520	7.2237	5.9018	6.5897	8.5656	11.1258	14.5977	16.4880	18.1628 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-31.6173	-49.7705	-79.6907	-94.8822	-103.3125	-95.1515	-93.6734	-86.8464	-73.4071	-58.2189	-35.8837	-26.4775 (233a)
(233a)m	-31.6173	-49.7705	-79.6907	-94.8822	-103.3125	-95.1515	-93.6734	-86.8464	-73.4071	-58.2189	-35.8837	-26.4775 (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)
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	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)	-11.1416	-28.3098	-69.6776	-126.6416	-187.1019	-196.7951	-191.7330	-151.6884	-98.1877	-46.1942	-16.1973	-8.3652 (233b)
(233b)m	-11.1416	-28.3098	-69.6776	-126.6416	-187.1019	-196.7951	-191.7330	-151.6884	-98.1877	-46.1942	-16.1973	-8.3652 (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)
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	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												635.0096 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												190.9295
Water heating fuel used												1132.3014 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVDecentralised, Database: total watage = 1.9320, total flow = 21.0000, SFP = 0.0920)												
mechanical ventilation fans (SFP = 0.0920)												18.3704 (230a)
Total electricity for the above, kWh/year												18.3704 (231)
Electricity for lighting (calculated in Appendix L)												142.6203 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1960.9652 (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												-32.6634 (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	635.0096	0.1561	99.1376 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1132.3014	0.1406	159.1878 (264)
Space and water heating			258.3254 (265)
Pumps, fans and electric keep-hot	18.3704	0.1387	2.5482 (267)
Energy for lighting	142.6203	0.1443	20.5845 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.9317	0.1335	-110.6654
PV Unit electricity exported	-1132.0335	0.1214	-137.4360
Total			-248.1014 (269)
Total CO2, kg/year			33.3567 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			0.5900 (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	635.0096	1.5780	1002.0157 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1132.3014	1.5198	1720.9023 (278)
Space and water heating			2722.9180 (279)
Pumps, fans and electric keep-hot	18.3704	1.5128	27.7907 (281)
Energy for lighting	142.6203	1.5338	218.7558 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-828.9317	1.4934	-1237.8974
PV Unit electricity exported	-1132.0335	0.4454	-504.2340
Total			-1742.1314 (283)
Total Primary energy kWh/year			1227.3332 (286)
Dwelling Primary energy Rate (DPER)			21.6000 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	56.8300 (1b)	x 2.8800 (2b)	= 163.6704 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 163.6704 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1222 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3722 (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) = 0.3164 (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	0.4034	0.3955	0.3875	0.3480	0.3401	0.3005	0.3005	0.2926	0.3164	0.3401	0.3559	0.3717 (22b)
Effective ac	0.5814	0.5782	0.5751	0.5606	0.5578	0.5452	0.5452	0.5428	0.5500	0.5578	0.5633	0.5691 (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
TER Opaque door			3.6700	1.0000	3.6700		(26)
TER Opening Type (Uw = 1.20)			10.1500	1.1450	11.6221		(27)
Heat Loss Floor 1			56.8300	0.1300	7.3879		(28a)
External wall	75.5100	13.8200	61.6900	0.1800	11.1042		(29a)
Corridor wall	15.1800		15.1800	0.1800	2.7324		(29a)
Commercial wall	4.8700		4.8700	0.1800	0.8766		(29a)
ceiling below corridor	2.1000		2.1000	0.1100	0.2310		(30)
External Roof 2	4.2300		4.2300	0.1100	0.4653		(30)
Total net area of external elements Aum(A, m ²)			158.7200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 38.0895		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
List of Thermal Bridges	
K1 Element	
E5 Ground floor (normal)	Length 34.2200 Psi-value 0.1600 Total 5.4752
E16 Corner (normal)	Length 11.5200 Psi-value 0.0900 Total 1.0368
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.5120 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 44.6015 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	
(38)m	Jan 31.3996 Feb 31.2290 Mar 31.0617 Apr 30.2762 May 30.1292 Jun 29.4450 Jul 29.4450 Aug 29.3183 Sep 29.7086 Oct 30.1292 Nov 30.4265 Dec 30.7374 (38)
Heat transfer coeff	76.0011 75.8305 75.6633 74.8777 74.7307 74.0466 74.0466 73.9199 74.3101 74.7307 75.0281 75.3389 (39)
Average = Sum(39)m / 12 =	74.8770
HLP	Jan 1.3373 Feb 1.3343 Mar 1.3314 Apr 1.3176 May 1.3150 Jun 1.3029 Jul 1.3029 Aug 1.3007 Sep 1.3076 Oct 1.3150 Nov 1.3202 Dec 1.3257 (40)
HLP (average)	1.3176

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Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												1.8907 (42)
Hot water usage for mixer showers												
	71.7862	70.7074	69.1354	66.1276	63.9079	61.4325	60.0255	61.5857	63.2959	65.9537	69.0261	71.5112 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	33.9931	32.7570	31.5209	30.2847	29.0486	27.8125	27.8125	29.0486	30.2847	31.5209	32.7570	33.9931 (42c)
Average daily hot water use (litres/day)												97.0873 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.7793	103.4644	100.6562	96.4123	92.9565	89.2450	87.8380	90.6343	93.5806	97.4745	101.7830	105.5043 (44)
Energy conte	167.5286	147.3319	154.7049	131.9836	125.1374	109.7372	106.2325	112.2242	115.3942	132.2720	145.0086	165.1942 (45)
Energy content (annual)	Total = Sum(45)m =											1612.7492
Distribution loss (46)m = 0.15 x (45)m												
	25.1293	22.0998	23.2057	19.7975	18.7706	16.4606	15.9349	16.8336	17.3091	19.8408	21.7513	24.7791 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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												
	214.1235	189.4176	201.2998	177.0755	171.7323	154.8290	152.8274	158.8191	160.4861	178.8669	190.1004	211.7891 (62)
WWHRS	-32.8177	-29.0242	-30.3925	-25.1662	-23.4540	-20.0697	-18.8122	-20.0049	-20.7649	-24.4795	-27.7324	-32.2099 (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												
	181.3058	160.3934	170.9073	151.9093	148.2783	134.7593	134.0152	138.8142	139.7212	154.3873	162.3681	179.5791 (64)
Total per year (kWh/year) = Sum(64)m =												1856.4386 (64)
12Total per year (kWh/year)												1856 (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												
	92.9792	82.6564	88.7153	79.9580	78.8841	72.5611	72.5982	74.5905	74.4421	81.2564	84.2888	92.2030 (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	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370	94.5370 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	85.0497	94.1622	85.0497	87.8847	85.0497	87.8847	85.0497	85.0497	87.8847	85.0497	87.8847	85.0497 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	164.8875	166.5985	162.2868	153.1077	141.5207	130.6306	123.3553	121.6443	125.9560	135.1351	146.7221	157.6122 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537	32.4537 (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)												
	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296	-75.6296 (71)
Water heating gains (Table 5)												
	124.9720	123.0006	119.2410	111.0528	106.0270	100.7793	97.5783	100.2560	103.3917	109.2155	117.0678	123.9287 (72)
Total internal gains												
	429.2703	438.1224	420.9386	406.4063	386.9585	370.6557	357.3444	358.3111	368.5936	383.7615	406.0357	420.9518 (73)

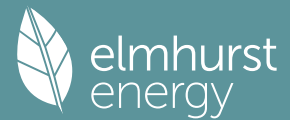
6. Solar gains												

[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a		Specific data		Specific data		factor		W	
			W/m2		or Table 6b		or Table 6c		Table 6d			
South	3.8000		46.7521		0.6300		0.7000		0.7700		54.2945 (78)	
West	6.3500		19.6403		0.6300		0.7000		0.7700		38.1147 (80)	

Solar gains	92.4093	163.4810	236.0594	307.1011	352.8757	353.0516	339.3316	305.5491	261.1332	184.3814	111.8821	78.2592 (83)
Total gains	521.6796	601.6034	656.9981	713.5075	739.8342	723.7073	696.6760	663.8602	629.7268	568.1429	517.9179	499.2110 (84)

7. Mean internal temperature (heating season)												

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n11,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	51.9272	52.0441	52.1591	52.7063	52.8100	53.2979	53.2979	53.3893	53.1089	52.8100	52.6007	52.3837
alpha	4.4618	4.4696	4.4773	4.5138	4.5207	4.5532	4.5532	4.5593	4.5406	4.5207	4.5067	4.4922
util living area	0.9888	0.9781	0.9570	0.9013	0.7924	0.6185	0.4597	0.5001	0.7267	0.9207	0.9781	0.9907 (86)
MIT	19.6258	19.8458	20.1448	20.5187	20.8008	20.9517	20.9899	20.9852	20.8989	20.5346	20.0187	19.5905 (87)
Th 2	19.8117	19.8140	19.8163	19.8271	19.8291	19.8385	19.8385	19.8403	19.8349	19.8291	19.8250	19.8208 (88)
util rest of house	0.9852	0.9712	0.9433	0.8699	0.7302	0.5210	0.3424	0.3801	0.6348	0.8884	0.9699	0.9877 (89)
MIT 2	18.2553	18.5339	18.9076	19.3631	19.6711	19.8130	19.8356	19.8356	19.7727	19.3944	18.7629	18.2170 (90)
Living area fraction									fLA = Living area / (4) =			0.5126 (91)
MIT	18.9578	19.2063	19.5418	19.9554	20.2502	20.3967	20.4273	20.4249	20.3500	19.9789	19.4066	18.9210 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9578	19.2063	19.5418	19.9554	20.2502	20.3967	20.4273	20.4249	20.3500	19.9789	19.4066	18.9210 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9817	0.9667	0.9394	0.8737	0.7542	0.5694	0.4027	0.4417	0.6779	0.8932	0.9662	0.9846 (94)
Useful gains	512.1313	581.5939	617.1745	623.4255	558.0156	412.0954	280.5780	293.2408	426.8940	507.4570	500.3978	491.5079 (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	1114.0071	1084.8571	986.7827	827.8045	638.9613	429.2234	283.3958	297.5181	464.4374	700.8910	923.3434	1109.0669 (97)
Space heating kWh	447.7956	338.1928	274.9885	147.1529	60.2236	0.0000	0.0000	0.0000	0.0000	143.9148	304.5209	459.4639 (98a)
Space heating requirement - total per year (kWh/year)												2176.2529
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	447.7956	338.1928	274.9885	147.1529	60.2236	0.0000	0.0000	0.0000	0.0000	143.9148	304.5209	459.4639 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2176.2529
Space heating per m2										(98c) / (4) =		38.2941 (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	447.7956	338.1928	274.9885	147.1529	60.2236	0.0000	0.0000	0.0000	0.0000	143.9148	304.5209	459.4639 (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)	485.1523	366.4061	297.9290	159.4289	65.2476	0.0000	0.0000	0.0000	0.0000	155.9207	329.9251	497.7940 (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	181.3058	160.3934	170.9073	151.9093	148.2783	134.7593	134.0152	138.8142	139.7212	154.3873	162.3681	179.5791 (64)
Efficiency of water heater	86.0045	85.6910	85.1204	83.9885	82.2065	79.8000	79.8000	79.8000	79.8000	83.9025	85.4486	79.8000 (216)
Fuel for water heating, kWh/month	210.8095	187.1765	200.7830	180.8692	180.3729	168.8713	167.9389	173.9527	175.0892	184.0079	190.0185	86.0721 (217)
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	17.6717	14.1769	12.7647	9.3520	7.2237	5.9018	6.5897	8.5656	11.1258	14.5977	16.4880	18.1628 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-26.9490	-38.1827	-55.1731	-62.4012	-67.6381	-63.3027	-62.5597	-58.9068	-52.4832	-43.8648	-29.7094	-23.2800 (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)	-14.6561	-30.8955	-61.5100	-92.5183	-122.4396	-123.0239	-121.5379	-102.8251	-75.2873	-44.1841	-19.5723	-11.5818 (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												2357.8038 (211)

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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	2228.5276 (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)	142.6203 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1404.4826 (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	3410.4692 (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	2357.8038	0.2100	495.1388 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2228.5276	0.2100	467.9908 (264)
Space and water heating			963.1296 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	142.6203	0.1443	20.5845 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-584.4507	0.1345	-78.5823
PV Unit electricity exported	-820.0319	0.1259	-103.2101
Total			-181.7924 (269)
Total CO2, kg/year			813.8510 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.3200 (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	2357.8038	1.1300	2664.3183 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2228.5276	1.1300	2518.2362 (278)
Space and water heating			5182.5545 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	142.6203	1.5338	218.7558 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-584.4507	1.4969	-874.8733
PV Unit electricity exported	-820.0319	0.4620	-378.8513
Total			-1253.7246 (283)
Total Primary energy kWh/year			4277.6865 (286)
Target Primary Energy Rate (TPER)			75.2700 (287)