

Full SAP Calculation Printout



Plot Reference	10482 Eiling Lodge				Issued on Date	18/06/2026	
Assessment Reference	Notional SAP			Plot Type Ref			
Plot Address	Eiling Lodge, Drivers End Lane, Hitchin, SG4 8TP				SAP Version	10.2	
SAP Rating	6 G	DER	28.18	TER	13.89		
Environmental	76 C	% DER < TER				-102.88	
CO ₂ Emissions (t/year)	2.2	DFEE	161.91	TFEE	65.98		
Compliance Check	See BREL	% DFEE < TFEE				-145.41	
% DPER < TPER	-290.01	DPER	290.99	TPER	74.61		
Assessor Details	Mr. Sean Wells				Assessor ID	T220-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	81.9700 (1b)	3.0700 (2b)	251.6479 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.9700		251.6479 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	251.6479 (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) = 0.1192 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8692 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8692 (21)

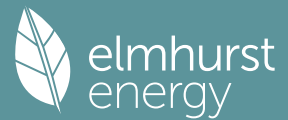
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	1.1082	1.0865	1.0648	0.9561	0.9344	0.8258	0.8258	0.8040	0.8692	0.9344	0.9779	1.0213 (22b)
Effective ac	1.1082	1.0865	1.0648	0.9571	0.9366	0.8409	0.8409	0.8232	0.8778	0.9366	0.9781	1.0213 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
window			8.0300	1.3258	10.6458		(27)
exist window			7.3500	2.4368	17.9106		(27)
existing door			5.4900	3.0000	16.4700		(26)
prop ground			14.8500	0.1800	2.6730		(28a)
exist ground			67.1200	0.4200	28.1904		(28a)
prop wall	31.5600	8.0300	23.5300	0.1800	4.2354		(29a)
exist wall	108.1300	12.8400	95.2900	0.4500	42.8805		(29a)
prop roof	19.3900		19.3900	0.1500	2.9085		(30)
new roof	4.1500		4.1500	0.1300	0.5395		(30)
exist roof	83.4700		83.4700	0.3500	29.2145		(30)
Total net area of external elements A _{um} (A, m ²)			328.6700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	155.6683	(33)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							65.7340 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		221.4023 (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
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(38)m	92.0331	90.2286	88.4240	79.4810	77.7752	69.8344	69.8344	68.3639	72.8931	77.7752	81.2261	84.8149 (38)
Heat transfer coeff	313.4354	311.6309	309.8263	300.8833	299.1775	291.2367	291.2367	289.7662	294.2954	299.1775	302.6283	306.2171 (39)
Average = Sum(39)m / 12 =												300.7926
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	3.8238	3.8018	3.7798	3.6707	3.6498	3.5530	3.5530	3.5350	3.5903	3.6498	3.6919	3.7357 (40)
HLP (average)												3.6695
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4992 (42)
Hot water usage for mixer showers												
	116.7857	115.0306	112.4731	107.5799	103.9688	99.9417	97.6527	100.1908	102.9731	107.2969	112.2953	116.3382 (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												
	42.3411	40.8015	39.2618	37.7221	36.1824	34.6427	34.6427	36.1824	37.7221	39.2618	40.8015	42.3411 (42c)
Average daily hot water use (litres/day)												146.1644 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	159.1268	155.8321	151.7349	145.3020	140.1512	134.5845	132.2955	136.3733	140.6952	146.5587	153.0968	158.6794 (44)
Energy conte	252.0180	221.9028	233.2109	198.9112	188.6705	165.4873	159.9999	168.8586	173.4912	198.8788	218.1144	248.4535 (45)
Energy content (annual)												Total = Sum(45)m =
Distribution loss (46)m = 0.15 x (45)m												2427.9971
	37.8027	33.2854	34.9816	29.8367	28.3006	24.8231	24.0000	25.3288	26.0237	29.8318	32.7172	37.2680 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												0.9283 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.2687 (55)
Total storage loss												
	39.3297	35.5236	39.3297	38.0610	39.3297	38.0610	39.3297	39.3297	38.0610	39.3297	38.0610	39.3297 (56)
If cylinder contains dedicated solar storage												
	39.3297	35.5236	39.3297	38.0610	39.3297	38.0610	39.3297	39.3297	38.0610	39.3297	38.0610	39.3297 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	291.3477	257.4264	272.5406	236.9722	228.0002	203.5483	199.3297	208.1883	211.5523	238.2085	256.1754	287.7832 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	291.3477	257.4264	272.5406	236.9722	228.0002	203.5483	199.3297	208.1883	211.5523	238.2085	256.1754	287.7832 (64)
Total per year (kWh/year) = Sum(64)m =												2891.0729 (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												
	115.2598	102.2016	109.0064	96.5868	94.1967	85.4734	84.6638	87.6093	88.1347	97.5910	102.9719	114.0746 (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	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	28.9063	25.6743	20.8797	15.8073	11.8161	9.9757	10.7791	14.0111	18.8056	23.8781	27.8692	29.7097 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	333.5947	337.0564	328.3331	309.7622	286.3199	264.2873	249.5683	246.1066	254.8299	273.4007	296.8431	318.8756 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671 (71)
Water heating gains (Table 5)												
	154.9190	152.0857	146.5140	134.1483	126.6085	118.7130	113.7954	117.7544	122.4093	131.1707	143.0165	153.3260 (72)
Total internal gains												
	619.8978	617.2942	598.2046	562.1957	527.2223	495.4538	476.6205	480.3498	498.5225	530.9273	570.2066	604.3892 (73)

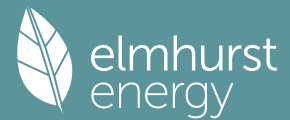
6. Solar gains

[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			
East				5.1500	19.6403	0.6300	0.7000	0.7700	30.9119 (76)			
South				2.8800	46.7521	0.6300	0.7000	0.7700	41.1496 (78)			
North				6.5500	10.6334	0.7600	0.7000	0.7700	25.6778 (74)			
West				0.8000	19.6403	0.7600	0.7000	0.7700	5.7927 (80)			
Solar gains	103.5320	188.2661	287.4784	403.4191	492.8842	506.8087	481.3806	412.3290	327.4587	216.3016	126.2195	87.1474 (83)
Total gains	723.4299	805.5603	885.6831	965.6148	1020.1065	1002.2626	958.0011	892.6788	825.9813	747.2288	696.4261	691.5366 (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 from living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	18.1612	18.2664	18.3728	18.9188	19.0267	19.5455	19.5455	19.6447	19.3423	19.0267	18.8097	18.5893
alpha	2.2107	2.2178	2.2249	2.2613	2.2684	2.3030	2.3030	2.3096	2.2895	2.2684	2.2540	2.2393
util living area												

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	0.9891	0.9854	0.9782	0.9630	0.9324	0.8729	0.7908	0.8219	0.9202	0.9698	0.9855	0.9903 (86)
MIT	17.0259	17.2756	17.7937	18.5704	19.3545	20.1003	20.5235	20.4537	19.8497	18.8552	17.8533	17.0352 (87)
Th 2	18.3947	18.4027	18.4108	18.4522	18.4603	18.4990	18.4990	18.5063	18.4839	18.4603	18.4439	18.4272 (88)
util rest of house												
	0.9846	0.9792	0.9679	0.9420	0.8825	0.7395	0.4950	0.5582	0.8315	0.9481	0.9780	0.9863 (89)
MIT 2	14.2191	14.5389	15.2000	16.1940	17.1668	18.0387	18.4070	18.3753	17.7831	16.5664	15.2893	14.2389 (90)
Living area fraction												0.4388 (91)
MIT	15.4508	15.7398	16.3382	17.2368	18.1268	18.9434	19.3358	19.2873	18.6900	17.5708	16.4145	15.4659 (92)
Temperature adjustment												0.0000
adjusted MIT	15.4508	15.7398	16.3382	17.2368	18.1268	18.9434	19.3358	19.2873	18.6900	17.5708	16.4145	15.4659 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9755	0.9680	0.9538	0.9257	0.8725	0.7735	0.6309	0.6749	0.8429	0.9352	0.9674	0.9780	(94)
Useful gains	705.6809	779.7720	844.7442	893.8416	890.0112	775.2781	604.3700	602.4966	696.1786	698.8061	673.7458	676.3288	(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	3495.0507	3378.0151	3048.1315	2508.3947	1922.7490	1264.9478	796.7563	836.6438	1350.8079	2085.4998	2818.8171	3449.8232	(97)
Space heating kWh	2075.2911	1746.0193	1639.3201	1162.4782	768.3569	0.0000	0.0000	0.0000	0.0000	1031.7001	1544.4513	2063.4798	(98a)
Space heating requirement - total per year (kWh/year)												12031.0970	
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	2075.2911	1746.0193	1639.3201	1162.4782	768.3569	0.0000	0.0000	0.0000	0.0000	1031.7001	1544.4513	2063.4798	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12031.0970	
Space heating per m2											(98c) / (4) =	146.7744	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	2075.2911	1746.0193	1639.3201	1162.4782	768.3569	0.0000	0.0000	0.0000	0.0000	1031.7001	1544.4513	2063.4798	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	2075.2911	1746.0193	1639.3201	1162.4782	768.3569	0.0000	0.0000	0.0000	0.0000	1031.7001	1544.4513	2063.4798	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	291.3477	257.4264	272.5406	236.9722	228.0002	203.5483	199.3297	208.1883	211.5523	238.2085	256.1754	287.7832	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	291.3477	257.4264	272.5406	236.9722	228.0002	203.5483	199.3297	208.1883	211.5523	238.2085	256.1754	287.7832	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	25.3015	20.2978	18.2759	13.3897	10.3426	8.4500	9.4349	12.2638	15.9295	20.9003	23.6069	26.0047	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												12031.0970	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												2891.0729	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												204.1976	(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												15126.3674	(238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	12031.0970	16.4900	1983.9279 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2891.0729	16.4900	476.7379 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	204.1976	16.4900	33.6722 (250)
Additional standing charges			0.0000 (251)
Total energy cost			2494.3380 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	7.0722 (257)
SAP value		6.4284
SAP rating (Section 12)		6 (258)
SAP band		G

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	12031.0970	0.1534	1845.9796 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2891.0729	0.1411	408.0250 (264)
Space and water heating			2254.0046 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	204.1976	0.1443	29.4720 (268)
Total CO2, kg/year			2283.4767 (272)
CO2 emissions per m2			27.8600 (273)
EI value			75.9009
EI rating			76 (274)
EI band			C

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	81.9700 (1b)	x 3.0700 (2b)	= 251.6479 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.9700		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 251.6479 (5)
Dwelling volume			

2. Ventilation rate

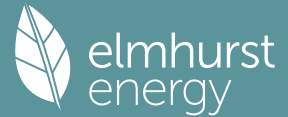
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1192 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8692 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8692 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.5000	4.5000	4.0000	3.9000	3.5000	3.5000	3.5000	3.7000	4.0000	4.0000	4.2000 (22)
Wind factor	1.1500	1.1250	1.1250	1.0000	0.9750	0.8750	0.8750	0.8750	0.9250	1.0000	1.0000	1.0500 (22a)
Adj infilt rate	0.9996	0.9779	0.9779	0.8692	0.8475	0.7606	0.7606	0.7606	0.8040	0.8692	0.8692	0.9127 (22b)
Effective ac	0.9996	0.9781	0.9781	0.8778	0.8591	0.7892	0.7892	0.7892	0.8232	0.8778	0.8778	0.9165 (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
Main dwelling							

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window				8.0300	1.3258	10.6458	(27)
exist window				7.3500	2.4368	17.9106	(27)
existing door				5.4900	3.0000	16.4700	(26)
prop ground				14.8500	0.1800	2.6730	(28a)
exist ground				67.1200	0.4200	28.1904	(28a)
prop wall		31.5600	8.0300	23.5300	0.1800	4.2354	(29a)
exist wall	108.1300	12.8400		95.2900	0.4500	42.8805	(29a)
prop roof	19.3900			19.3900	0.1500	2.9085	(30)
new roof	4.1500			4.1500	0.1300	0.5395	(30)
exist roof	83.4700			83.4700	0.3500	29.2145	(30)
Total net area of external elements Aum(A, m2)				328.6700			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	155.6683		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							65.7340 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	221.4023 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	83.0103	81.2261	81.2261	72.8931	71.3441	65.5405	65.5405	65.5405	68.3639	72.8931	72.8931	76.1086	(38)
Heat transfer coeff	304.4126	302.6283	302.6283	294.2954	292.7464	286.9427	286.9427	286.9427	289.7662	294.2954	294.2954	297.5109	(39)
Average = Sum(39)m / 12 =												294.4506	
HLP	3.7137	3.6919	3.6919	3.5903	3.5714	3.5006	3.5006	3.5006	3.5350	3.5903	3.5903	3.6295	(40)
HLP (average)												3.5922	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

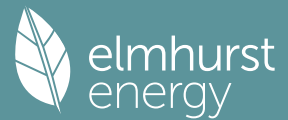
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.4992 (42)
Hot water usage for mixer showers												
116.7857	115.0306	112.4731	107.5799	103.9688	99.9417	97.6527	100.1908	102.9731	107.2969	112.2953	116.3382	(42a)
Hot water usage for baths												
0.0000	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												
42.3411	40.8015	39.2618	37.7221	36.1824	34.6427	34.6427	36.1824	37.7221	39.2618	40.8015	42.3411	(42c)
Average daily hot water use (litres/day)												146.1644 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
159.1268	155.8321	151.7349	145.3020	140.1512	134.5845	132.2955	136.3733	140.6952	146.5587	153.0968	158.6794	(44)
Energy conte	252.0180	221.9028	233.2109	198.9112	188.6705	165.4873	159.9999	168.8586	173.4912	198.8788	218.1144	248.4535 (45)
Energy content (annual)	Total = Sum(45)m =											2427.9971
Distribution loss (46)m = 0.15 x (45)m												
37.8027	33.2854	34.9816	29.8367	28.3006	24.8231	24.0000	25.3288	26.0237	29.8318	32.7172	37.2680	(46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												0.9283 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.2687 (55)
Total storage loss												
39.3297	35.5236	39.3297	38.0610	39.3297	38.0610	39.3297	39.3297	38.0610	39.3297	38.0610	39.3297	(56)
If cylinder contains dedicated solar storage												
39.3297	35.5236	39.3297	38.0610	39.3297	38.0610	39.3297	39.3297	38.0610	39.3297	38.0610	39.3297	(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	(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	(61)
Total heat required for water heating calculated for each month												
291.3477	257.4264	272.5406	236.9722	228.0002	203.5483	199.3297	208.1883	211.5523	238.2085	256.1754	287.7832	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
291.3477	257.4264	272.5406	236.9722	228.0002	203.5483	199.3297	208.1883	211.5523	238.2085	256.1754	287.7832	(64)
Total per year (kWh/year) = Sum(64)m =												2891.0729 (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												
115.2598	102.2016	109.0064	96.5868	94.1967	85.4734	84.6638	87.6093	88.1347	97.5910	102.9719	114.0746	(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	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	28.9063	25.6743	20.8797	15.8073	11.8161	9.9757	10.7791	14.0111	18.8056	23.8781	27.8692	29.7097 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	333.5947	337.0564	328.3331	309.7622	286.3199	264.2873	249.5683	246.1066	254.8299	273.4007	296.8431	318.8756 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671 (71)
Water heating gains (Table 5)												
	154.9190	152.0857	146.5140	134.1483	126.6085	118.7130	113.7954	117.7544	122.4093	131.1707	143.0165	153.3260 (72)
Total internal gains												
	619.8978	617.2942	598.2046	562.1957	527.2223	495.4538	476.6205	480.3498	498.5225	530.9273	570.2066	604.3892 (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								

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East			5.1500	22.3829		0.6300	0.7000	0.7700	35.2287 (76)
South			2.8800	51.4430		0.6300	0.7700	0.7700	45.2784 (78)
North			6.5500	12.0246		0.7600	0.7000	0.7700	29.0374 (74)
West			0.8000	22.3829		0.7600	0.7000	0.7700	6.6016 (80)

Solar gains	116.1461	193.8571	294.0587	420.5139	502.9809	550.4430	514.7928	445.4705	353.4341	233.9079	141.4278	96.7670 (83)
Total gains	736.0439	811.1513	892.2634	982.7096	1030.2032	1045.8968	991.4133	925.8203	851.9566	764.8351	711.6344	701.1562 (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	18.6995	18.8097	18.8097	19.3423	19.4447	19.8380	19.8380	19.8380	19.6447	19.3423	19.3423	19.1333	
alpha	2.2466	2.2540	2.2540	2.2895	2.2963	2.3225	2.3225	2.3225	2.3096	2.2895	2.2895	2.2756	
util living area	0.9887	0.9853	0.9773	0.9595	0.9231	0.8393	0.7226	0.7539	0.9029	0.9658	0.9844	0.9900 (86)	
MIT	17.1439	17.3591	17.9111	18.7097	19.5251	20.2799	20.6838	20.6406	20.0106	19.0043	17.9840	17.1493 (87)	
Th 2	18.4356	18.4439	18.4439	18.4839	18.4915	18.5206	18.5206	18.5206	18.5063	18.4839	18.4839	18.4683 (88)	
util rest of house	0.9840	0.9791	0.9664	0.9362	0.8639	0.6658	0.3322	0.3773	0.7895	0.9402	0.9763	0.9859 (89)	
MIT 2	14.3795	14.6558	15.3583	16.3790	17.3832	18.2193	18.4961	18.4858	17.9690	16.7609	15.4679	14.3958 (90)	
Living area fraction									fLA = Living area / (4) =				0.4388 (91)
MIT	15.5926	15.8420	16.4785	17.4017	18.3231	19.1235	19.4561	19.4314	18.8649	17.7454	16.5720	15.6041 (92)	
Temperature adjustment												0.0000	
adjusted MIT	15.5926	15.8420	16.4785	17.4017	18.3231	19.1235	19.4561	19.4314	18.8649	17.7454	16.5720	15.6041 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9748	0.9680	0.9522	0.9201	0.8579	0.7243	0.5249	0.5633	0.8142	0.9276	0.9655	0.9775 (94)
Useful gains	717.4614	785.1742	849.6155	904.1711	883.8084	757.5632	520.3525	521.5528	693.6483	709.4803	687.0931	685.4034 (95)
Ext temp.	4.4000	4.9000	6.7000	9.2000	12.2000	15.2000	17.3000	17.2000	14.6000	11.0000	7.3000	4.3000 (96)
Heat loss rate W	3407.1589	3311.3681	2959.2441	2413.7307	1792.5258	1125.8254	618.6728	640.2749	1235.8213	1985.1303	2728.7118	3363.0962 (97)
Space heating kWh	2001.1350	1697.6023	1569.5637	1086.8829	676.0857	0.0000	0.0000	0.0000	0.0000	949.0836	1469.9655	1992.2035 (98a)
Space heating requirement - total per year (kWh/year)												11442.5220
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	2001.1350	1697.6023	1569.5637	1086.8829	676.0857	0.0000	0.0000	0.0000	0.0000	949.0836	1469.9655	1992.2035 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11442.5220
Space heating per m2										(98c) / (4) =		139.5940 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2001.1350	1697.6023	1569.5637	1086.8829	676.0857	0.0000	0.0000	0.0000	0.0000	949.0836	1469.9655	1992.2035 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	2001.1350	1697.6023	1569.5637	1086.8829	676.0857	0.0000	0.0000	0.0000	0.0000	949.0836	1469.9655	1992.2035 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	291.3477	257.4264	272.5406	236.9722	228.0002	203.5483	199.3297	208.1883	211.5523	238.2085	256.1754	287.7832 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	291.3477	257.4264	272.5406	236.9722	228.0002	203.5483	199.3297	208.1883	211.5523	238.2085	256.1754	287.7832 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	25.3015	20.2978	18.2759	13.3897	10.3426	8.4500	9.4349	12.2638	15.9295	20.9003	23.6069	26.0047 (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												11442.5220 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000

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Water heating fuel used	2891.0729 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	204.1976 (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	14537.7925 (238)

10a. Fuel costs - using BEDF prices (595)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	11442.5220	27.6700	3166.1459 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2891.0729	27.6700	799.9599 (247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	204.1976	27.6700	56.5015 (250)
Additional standing charges			0.0000 (251)
Total energy cost			4022.6072 (255)

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	11442.5220	0.1537	1758.3815 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2891.0729	0.1411	408.0250 (264)
Space and water heating			2166.4065 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	204.1976	0.1443	29.4720 (268)
Total CO2, kg/year			2195.8786 (272)

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	11442.5220	1.5689	17952.5670 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2891.0729	1.5219	4399.8353 (278)
Space and water heating			22352.4024 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	204.1976	1.5338	313.2050 (282)
Total Primary energy kWh/year			22665.6074 (286)

SAP 10 EPC IMPROVEMENTS

Notional SAP

Current energy efficiency rating:	G 6
Current environmental impact rating:	C 76

N Solar water heating			Recommended
U Solar photovoltaic panels			Recommended
V2 Wind turbine			Recommended
Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.4	-£ 204	-94 kg (4.3%)
U Solar photovoltaic panels	+ 3.9	-£ 296	-145 kg (6.9%)
V2 Wind turbine	+ 10.8	-£ 693	-347 kg (17.7%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar water heating	£204	1.15 kg/m²	G 9 C 77
Solar photovoltaic panels	£296	1.77 kg/m²	G 13 C 78
Wind turbine	£693	4.24 kg/m²	F 24 B 82
Total Savings	£1193	7.15 kg/m²	

Potential energy efficiency rating:	F 24
Potential environmental impact rating:	B 82

Fuel prices for cost data on this page from database revision number 595 TEST (29 May 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£4023	£3819	£204
Space heating	£3166	£3200	-£34
Water heating	£800	£562	£238
Lighting	£57	£57	£0
Generated (PV)	-£0	-£296	£296
Generated (wind)	-£0	-£693	£693

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Total cost of fuels	£4023	£2830	£1193
Total cost of uses	£4023	£2830	£1193
Delivered energy	177 kWh/m²	125 kWh/m²	53 kWh/m²
Carbon dioxide emissions	2.2 tonnes	1.6 tonnes	0.6 tonnes
CO2 emissions per m²	27 kg/m²	20 kg/m²	7 kg/m²
Primary energy	277 kWh/m²	197 kWh/m²	79 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Main dwelling	81.9700 (1b)	x 3.0700 (2b)	= 251.6479 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.9700		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 251.6479 (5)
Dwelling volume			

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)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1192 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.8692 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.8692 (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	1.1082	1.0865	1.0648	0.9561	0.9344	0.8258	0.8258	0.8040	0.8692	0.9344	0.9779	1.0213 (22b)
Effective ac	1.1082	1.0865	1.0648	0.9571	0.9366	0.8409	0.8409	0.8232	0.8778	0.9366	0.9781	1.0213 (25)

3. Heat losses and heat loss parameter

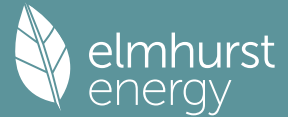
Element	Gross m²	Openings m²	NetArea m²	U-value W/m²K	A x U W/K	K-value kJ/m²K	A x K kJ/K
Main dwelling							
window			8.0300	1.3258	10.6458		(27)
exist window			7.3500	2.4368	17.9106		(27)
existing door			5.4900	3.0000	16.4700		(26)
prop ground			14.8500	0.1800	2.6730		(28a)
exist ground			67.1200	0.4200	28.1904		(28a)
prop wall	31.5600	8.0300	23.5300	0.1800	4.2354		(29a)
exist wall	108.1300	12.8400	95.2900	0.4500	42.8805		(29a)
prop roof	19.3900		19.3900	0.1500	2.9085		(30)
new roof	4.1500		4.1500	0.1300	0.5395		(30)
exist roof	83.4700		83.4700	0.3500	29.2145		(30)
Total net area of external elements Aum(A, m²)			328.6700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		155.6683		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							65.7340 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	221.4023 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	92.0331	90.2286	88.4240	79.4810	77.7752	69.8344	69.8344	68.3639	72.8931	77.7752	81.2261	84.8149 (38)
Heat transfer coeff	313.4354	311.6309	309.8263	300.8833	299.1775	291.2367	291.2367	289.7662	294.2954	299.1775	302.6283	306.2171 (39)
Average = Sum(39)m / 12 =												300.7926

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	3.8238	3.8018	3.7798	3.6707	3.6498	3.5530	3.5530	3.5350	3.5903	3.6498	3.6919	3.7357 (40)
HLP (average)												3.6695
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

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Assumed occupancy												2.4992 (42)
Hot water usage for mixer showers												
116.7857	115.0306	112.4731	107.5799	103.9688	99.9417	97.6527	100.1908	102.9731	107.2969	112.2953	116.3382	(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												
42.3411	40.8015	39.2618	37.7221	36.1824	34.6427	34.6427	36.1824	37.7221	39.2618	40.8015	42.3411	(42c)
Average daily hot water use (litres/day)												146.1644 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	159.1268	155.8321	151.7349	145.3020	140.1512	134.5845	132.2955	136.3733	140.6952	146.5587	153.0968	158.6794 (44)
Energy conte	252.0180	221.9028	233.2109	198.9112	188.6705	165.4873	159.9999	168.8586	173.4912	198.8788	218.1144	248.4535 (45)
Energy content (annual)												Total = Sum(45)m = 2427.9971
Distribution loss (46)m = 0.15 x (45)m												
37.8027	33.2854	34.9816	29.8367	28.3006	24.8231	24.0000	25.3288	26.0237	29.8318	32.7172	37.2680	(46)
Water storage loss (or HIU loss):												
Store volume												190.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												0.8580 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.4853 (55)
Total storage loss												
46.0429	41.5871	46.0429	44.5576	46.0429	44.5576	46.0429	46.0429	46.0429	44.5576	46.0429	44.5576	46.0429 (56)
If cylinder contains dedicated solar storage												
27.8681	25.1712	27.8681	26.9691	27.8681	26.9691	27.8681	27.8681	26.9691	27.8681	26.9691	27.8681	(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	(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	(61)
Total heat required for water heating calculated for each month												
279.8860	247.0739	261.0790	225.8802	216.5385	192.4564	187.8680	196.7267	200.4603	226.7469	245.0835	276.3216	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
If combined cylinder, total volume of cylinder												190.0000 (H13)
Effective solar volume												109.5000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.1973 (H16)
Heat delivered to hot water												665.0905 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												665.0905
Solar input	-0.0000	-19.7475	-62.4820	-84.8415	-110.5496	-101.9498	-101.2228	-88.7461	-61.9473	-32.8529	-0.7510	-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	(63d)
Output from w/h	279.8860	227.3264	198.5970	141.0387	105.9889	90.5066	86.6452	107.9806	138.5130	193.8940	244.3325	276.3216 (64)
											Total per year (kWh/year) = Sum(64)m =	2091.0305 (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	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000 (64a)
Heat gains from water heating, kWh/month	106.0904	93.9196	99.8371	87.7132	85.0274	76.5998	75.4944	78.4399	79.2611	88.4216	94.0983	104.9052 (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	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.9063	25.6743	20.8797	15.8073	11.8161	9.9757	10.7791	14.0111	18.8056	23.8781	27.8692	29.7097 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.5947	337.0564	328.3331	309.7622	286.3199	264.2873	249.5683	246.1066	254.8299	273.4007	296.8431	318.8756 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671 (71)
Water heating gains (Table 5)	142.5947	139.7613	134.1896	121.8239	114.2841	106.3886	101.4710	105.4300	110.0849	118.8463	130.6921	141.0017 (72)
Total internal gains	607.5735	604.9698	585.8803	549.8713	514.8979	483.1294	464.2961	468.0255	486.1982	518.6029	557.8822	592.0648 (73)

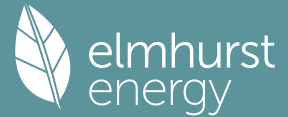
6. Solar gains

[Jan]												Gains
			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			
East			5.1500	19.6403		0.6300	0.7000		0.7700		30.9119 (76)	
South			2.8800	46.7521		0.6300	0.7000		0.7700		41.1496 (78)	
North			6.5500	10.6334		0.7600	0.7000		0.7700		25.6778 (74)	
West			0.8000	19.6403		0.7600	0.7000		0.7700		5.7927 (80)	
Solar gains	103.5320	188.2661	287.4784	403.4191	492.8842	506.8087	481.3806	412.3290	327.4587	216.3016	126.2195	87.1474 (83)
Total gains	711.1055	793.2359	873.3587	953.2904	1007.7821	989.9382	945.6767	880.3545	813.6569	734.9045	684.1018	679.2122 (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	18.1612	18.2664	18.3728	18.9188	19.0267	19.5455	19.5455	19.6447	19.3423	19.0267	18.8097	18.5893
alpha	2.2107	2.2178	2.2249	2.2613	2.2684	2.3030	2.3030	2.3096	2.2895	2.2684	2.2540	2.2393

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util living area	0.9895	0.9859	0.9788	0.9639	0.9339	0.8754	0.7945	0.8255	0.9223	0.9708	0.9860	0.9907 (86)
MIT	17.0154	17.2652	17.7835	18.5605	19.3455	20.0928	20.5178	20.4474	19.8410	18.8452	17.8428	17.0245 (87)
Th 2	18.3947	18.4027	18.4108	18.4522	18.4603	18.4990	18.4990	18.5063	18.4839	18.4603	18.4439	18.4272 (88)
util rest of house												
MIT 2	0.9852	0.9799	0.9688	0.9433	0.8849	0.7435	0.4998	0.5634	0.8353	0.9497	0.9788	0.9868 (89)
Living area fraction	14.2059	14.5258	15.1874	16.1821	17.1569	18.0327	18.4051	18.3726	17.7748	16.5543	15.2761	14.2254 (90)
MIT	15.4387	15.7279	16.3266	17.2258	18.1173	18.9367	19.3322	19.2830	18.6815	17.5596	16.4024	15.4537 (91)
Temperature adjustment												0.0000 (92)
adjusted MIT	15.4387	15.7279	16.3266	17.2258	18.1173	18.9367	19.3322	19.2830	18.6815	17.5596	16.4024	15.4537 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9762	0.9689	0.9549	0.9272	0.8746	0.7768	0.6352	0.6794	0.8460	0.9370	0.9685	0.9787 (94)
Useful gains	694.2043	768.5376	833.9513	883.8804	881.4537	768.9927	600.6593	598.0834	688.3498	688.5728	662.5355	664.7739 (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	3491.2774	3374.3074	3044.5430	2505.0928	1919.9179	1263.0120	795.7246	835.4043	1348.3042	2082.1411	2815.1753	3446.0794 (97)
Space heating kWh	2081.0223	1751.0773	1644.6802	1167.2729	772.6173	0.0000	0.0000	0.0000	0.0000	1036.8148	1549.9006	2069.2913 (98a)
Space heating requirement - total per year (kWh/year)												12072.6768
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	2081.0223	1751.0773	1644.6802	1167.2729	772.6173	0.0000	0.0000	0.0000	0.0000	1036.8148	1549.9006	2069.2913 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12072.6768
Space heating per m2										(98c) / (4) =		147.2816 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2081.0223	1751.0773	1644.6802	1167.2729	772.6173	0.0000	0.0000	0.0000	0.0000	1036.8148	1549.9006	2069.2913 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	2081.0223	1751.0773	1644.6802	1167.2729	772.6173	0.0000	0.0000	0.0000	0.0000	1036.8148	1549.9006	2069.2913 (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	279.8860	227.3264	198.5970	141.0387	105.9889	90.5066	86.6452	107.9806	138.5130	193.8940	244.3325	276.3216 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	279.8860	227.3264	198.5970	141.0387	105.9889	90.5066	86.6452	107.9806	138.5130	193.8940	244.3325	276.3216 (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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945 (231)
Lighting	25.3015	20.2978	18.2759	13.3897	10.3426	8.4500	9.4349	12.2638	15.9295	20.9003	23.6069	26.0047 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-43.7634	-69.0448	-110.0050	-134.4299	-148.5098	-96.0145	-94.3904	-89.9868	-80.1043	-81.7129	-50.2241	-37.0325 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	-212.5732	-192.0016	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732 (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												12072.6768 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												2091.0305 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
pump for solar water heating												80.0000 (230g)
Total electricity for the above, kWh/year												80.0000 (231)
Electricity for lighting (calculated in Appendix L)												204.1976 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1035.2184 (233)
Wind generation												-3575.5408 (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												10909.8079 (238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	12072.6768	16.4900	1990.7844 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2091.0305	16.4900	344.8109 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	204.1976	16.4900	33.6722 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1035.2184	16.4900	-170.7075
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-170.7075 (252)
Wind Turbine electricity used in dwelling	-2502.8785	16.4900	-412.7247
Wind Turbine electricity exported	0.0000	5.5900	0.0000
Total			-412.7247 (252)
Total energy cost			1799.0273 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	5.1008 (257)
SAP value		23.5295
SAP rating (Section 12)		24 (258)
SAP band		F

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	12072.6768	0.1534	1852.2569 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2091.0305	0.1455	304.3131 (264)
Space and water heating			2156.5700 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	204.1976	0.1443	29.4720 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1035.2184	0.1356	-140.4215
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-140.4215 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-347.1801 (269)
Total CO2, kg/year			1709.5373 (272)
CO2 emissions per m2			20.8600 (273)
EI value			81.9581
EI rating			82 (274)
EI band			B

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

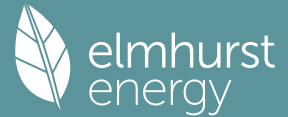
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	81.9700 (1b)	x 3.0700 (2b)	= 251.6479 (1b) - (3b)
Ground floor			(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	81.9700		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 251.6479 (5)
Dwelling volume			

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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 30.0000 / (5) = 0.1192 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8692 (18)
Number of sides sheltered	0 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 1.0000 \quad (20)$$
$$(21) = (18) \times (20) = 0.8692 \quad (21)$$

Wind speed	Jan 4.6000	Feb 4.5000	Mar 4.5000	Apr 4.0000	May 3.9000	Jun 3.5000	Jul 3.5000	Aug 3.5000	Sep 3.7000	Oct 4.0000	Nov 4.0000	Dec 4.2000	(22)
Wind factor	1.1500	1.1250	1.1250	1.0000	0.9750	0.8750	0.8750	0.8750	0.9250	1.0000	1.0000	1.0500	(22a)
Adj infilt rate													
Effective ac	0.9996	0.9779	0.9779	0.8692	0.8475	0.7606	0.7606	0.7606	0.8040	0.8692	0.8692	0.9127	(22b)
	0.9996	0.9781	0.9781	0.8778	0.8591	0.7892	0.7892	0.7892	0.8232	0.8778	0.8778	0.9165	(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
Main dwelling							
window			8.0300	1.3258	10.6458		(27)
exist window			7.3500	2.4368	17.9106		(27)
existing door			5.4900	3.0000	16.4700		(26)
prop ground			14.8500	0.1800	2.6730		(28a)
exist ground			67.1200	0.4200	28.1904		(28a)
prop wall	31.5600	8.0300	23.5300	0.1800	4.2354		(29a)
exist wall	108.1300	12.8400	95.2900	0.4500	42.8805		(29a)
prop roof	19.3900		19.3900	0.1500	2.9085		(30)
new roof	4.1500		4.1500	0.1300	0.5395		(30)
exist roof	83.4700		83.4700	0.3500	29.2145		(30)
Total net area of external elements Aum(A, m2)			328.6700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	155.6683		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area) 65.7340 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 221.4023 (37)

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

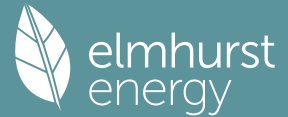
(38)m	Jan 83.0103	Feb 81.2261	Mar 81.2261	Apr 72.8931	May 71.3441	Jun 65.5405	Jul 65.5405	Aug 65.5405	Sep 68.3639	Oct 72.8931	Nov 72.8931	Dec 76.1086	(38)
Heat transfer coeff	304.4126	302.6283	302.6283	294.2954	292.7464	286.9427	286.9427	286.9427	289.7662	294.2954	294.2954	297.5109	(39)
Average = Sum(39)m / 12 =												294.4506	

HLP	Jan 3.7137	Feb 3.6919	Mar 3.6919	Apr 3.5903	May 3.5714	Jun 3.5006	Jul 3.5006	Aug 3.5006	Sep 3.5350	Oct 3.5903	Nov 3.5903	Dec 3.6295	(40)
HLP (average)												3.5922	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4992	(42)
Hot water usage for mixer showers														
116.7857	115.0306	112.4731	107.5799	103.9688	99.9417	97.6527	100.1908	102.9731	107.2969	112.2953	116.3382	(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														
42.3411	40.8015	39.2618	37.7221	36.1824	34.6427	34.6427	36.1824	37.7221	39.2618	40.8015	42.3411	(42c)		
Average daily hot water use (litres/day)												(43)	146.1644	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Daily hot water use														
159.1268	155.8321	151.7349	145.3020	140.1512	134.5845	132.2955	136.3733	140.6952	146.5587	153.0968	158.6794	(44)		
Energy content	252.0180	221.9028	233.2109	198.9112	188.6705	165.4873	159.9999	168.8586	173.4912	198.8788	218.1144	(45)	248.4535	
Energy content (annual)														
Distribution loss (46)m = 0.15 x (45)m														
37.8027	33.2854	34.9816	29.8367	28.3006	24.8231	24.0000	25.3288	26.0237	29.8318	32.7172	37.2680	(46)		
Water storage loss (or HIU loss):														
Store volume													190.0000	(47)
b) If manufacturer declared loss factor is not known :														
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152	(51)
Volume factor from Table 2a													0.8580	(52)
Temperature factor from Table 2b													0.6000	(53)
Enter (49) or (54) in (55)													1.4853	(55)
Total storage loss	46.0429	41.5871	46.0429	44.5576	46.0429	44.5576	46.0429	46.0429	44.5576	46.0429	44.5576	(56)	46.0429	
If cylinder contains dedicated solar storage	27.8681	25.1712	27.8681	26.9691	27.8681	26.9691	27.8681	27.8681	26.9691	27.8681	26.9691	(57)	27.8681	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	0.0000	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	0.0000	
Total heat required for water heating calculated for each month	279.8860	247.0739	261.0790	225.8802	216.5385	192.4564	187.8680	196.7267	200.4603	226.7469	245.0835	(62)	276.3216	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)	0.0000	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)	-0.0000	
Aperture area of solar collector												(H1)	3.0000	
Zero-loss collector efficiency												(H2)	0.8000	
Collector linear heat loss coefficient												(H3)	1.8000	
Collector 2nd order heat loss coefficient												(H4)	0.0000	
Collector loop efficiency												(H5)	0.9000	
Incidence angle modifier												(H6)	1.0000	
Overshading factor												(H8)	0.8000	
Overall heat loss coefficient of system												(H10)	6.5000	
Heat loss coefficient of collector loop												(H11)	3.9667	
Dedicated solar storage volume												(H12)	75.0000	
If combined cylinder, total volume of cylinder												(H13)	190.0000	
Effective solar volume												(H14)	109.5000	
Reference volume												(H15)	225.0000	
Storage tank correction coefficient												(H16)	1.1973	
Heat delivered to hot water												(H24)	723.6618	
Heat delivered to space heating												(H29)	0.0000	
Solar input													723.6618	
Solar input	-1.2888	-21.5158	-64.8297	-89.3967	-113.0803	-111.5597	-109.1039	-97.7075	-69.5137	-39.3230	-6.3425	(63c)	-0.0000	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	0.0000	
Output from w/h	278.5972	225.5581	196.2492	136.4835	103.4582	80.8966	78.7640	99.0192	130.9466	187.4239	238.7409	(64)	276.3216	
													2032.4592	(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	

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Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	106.0904	93.9196	99.8371	87.7132	85.0274	76.5998	75.4944	78.4399	79.2611	88.4216	94.0983	104.9052 (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	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	149.9507	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.9063	25.6743	20.8797	15.8073	11.8161	9.9757	10.7791	14.0111	18.8056	23.8781	27.8692	29.7097	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.5947	337.0564	328.3331	309.7622	286.3199	264.2873	249.5683	246.1066	254.8299	273.4007	296.8431	318.8756	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	52.4942	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	-99.9671	(71)
Water heating gains (Table 5)	142.5947	139.7613	134.1896	121.8239	114.2841	106.3886	101.4710	105.4300	110.0849	118.8463	130.6921	141.0017	(72)
Total internal gains	607.5735	604.9698	585.8803	549.8713	514.8979	483.1294	464.2961	468.0255	486.1982	518.6029	557.8822	592.0648	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g or Table 6c	FF Specific data or Table 6c		Access factor Table 6d		Gains W
East				5.1500	22.3829		0.6300	0.7000		0.7700		35.2287 (76)
South				2.8800	51.4430		0.6300	0.7000		0.7700		45.2784 (78)
North				6.5500	12.0246		0.7600	0.7000		0.7700		29.0374 (74)
West				0.8000	22.3829		0.7600	0.7000		0.7700		6.6016 (80)
Solar gains	116.1461	193.8571	294.0587	420.5139	502.9809	550.4430	514.7928	445.4705	353.4341	233.9079	141.4278	96.7670 (83)
Total gains	723.7196	798.8270	879.9390	970.3852	1017.8788	1033.5725	979.0889	913.4959	839.6323	752.5108	699.3100	688.8318 (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	21.0000 (85)
tau	18.6995	18.8097	18.8097	19.3423	19.4447	19.8380	19.8380	19.8380	19.6447	19.3423	19.3423	19.1333	
alpha	2.2466	2.2540	2.2540	2.2895	2.2963	2.3225	2.3225	2.3225	2.3096	2.2895	2.2895	2.2756	
util living area	0.9891	0.9858	0.9779	0.9605	0.9248	0.8423	0.7268	0.7581	0.9054	0.9668	0.9850	0.9904	(86)
MIT	17.1333	17.3486	17.9008	18.6998	19.5163	20.2732	20.6794	20.6357	20.0023	18.9943	17.9734	17.1385	(87)
Th 2	18.4356	18.4439	18.4439	18.4839	18.4915	18.5206	18.5206	18.5206	18.5063	18.4839	18.4839	18.4683	(88)
util rest of house	0.9846	0.9797	0.9673	0.9377	0.8665	0.6701	0.3359	0.3816	0.7937	0.9420	0.9772	0.9864	(89)
MIT 2	14.3661	14.6425	15.3455	16.3672	17.3739	18.2148	18.4955	18.4849	17.9618	16.7490	15.4546	14.3822	(90)
Living area fraction	15.5804	15.8300	16.4668	17.3908	18.3140	19.1181	19.4538	19.4287	18.8572	17.7343	16.5599	15.5917	(91)
MIT	15.5804	15.8300	16.4668	17.3908	18.3140	19.1181	19.4538	19.4287	18.8572	17.7343	16.5599	15.5917	(92)
Temperature adjustment	15.5804	15.8300	16.4668	17.3908	18.3140	19.1181	19.4538	19.4287	18.8572	17.7343	16.5599	15.5917	(93)
adjusted MIT	15.5804	15.8300	16.4668	17.3908	18.3140	19.1181	19.4538	19.4287	18.8572	17.7343	16.5599	15.5917	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9755	0.9689	0.9533	0.9217	0.8602	0.7278	0.5291	0.5679	0.8176	0.9295	0.9666	0.9783	(94)
Useful gains	706.0152	773.9491	838.8800	894.3801	875.6286	752.2724	518.0660	518.8049	686.4950	699.4728	675.9530	673.8708	(95)
Ext temp.	4.4000	4.9000	6.7000	9.2000	12.2000	15.2000	17.3000	17.2000	14.6000	11.0000	7.3000	4.3000	(96)
Heat loss rate W	3403.4501	3307.7202	2955.7159	2410.5204	1789.8642	1124.2636	618.0278	639.5150	1233.5920	1981.8690	2725.1418	3359.4148	(97)
Space heating kWh	2006.8916	1702.6942	1574.9259	1091.6210	680.1913	0.0000	0.0000	0.0000	0.0000	954.1028	1475.4159	1998.0447	(98a)
Space heating requirement - total per year (kWh/year)												11483.8875	
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	2006.8916	1702.6942	1574.9259	1091.6210	680.1913	0.0000	0.0000	0.0000	0.0000	954.1028	1475.4159	1998.0447	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11483.8875	
Space heating per m ²												140.0987	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	2006.8916	1702.6942	1574.9259	1091.6210	680.1913	0.0000	0.0000	0.0000	0.0000	954.1028	1475.4159	1998.0447	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	2006.8916	1702.6942	1574.9259	1091.6210	680.1913	0.0000	0.0000	0.0000	0.0000	954.1028	1475.4159	1998.0447	(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)													

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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 (213)
	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 requirement	278.5972	225.5581	196.2492	136.4835	103.4582	80.8966	78.7640	99.0192	130.9466	187.4239	238.7409	276.3216 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	278.5972	225.5581	196.2492	136.4835	103.4582	80.8966	78.7640	99.0192	130.9466	187.4239	238.7409	276.3216 (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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945 (231)
Lighting	25.3015	20.2978	18.2759	13.3897	10.3426	8.4500	9.4349	12.2638	15.9295	20.9003	23.6069	26.0047 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-48.7635	-70.8743	-111.6133	-137.3647	-147.1299	-98.6882	-96.4490	-92.8292	-83.4566	-86.7109	-55.6806	-40.9231 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	-212.5732	-192.0016	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732	-212.5732	-205.7160	-212.5732	-205.7160	-212.5732 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												11483.8875 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												2032.4592 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
pump for solar water heating												80.0000 (230g)
Total electricity for the above, kWh/year												80.0000 (231)
Electricity for lighting (calculated in Appendix L)												204.1976 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1070.4831 (233)
Wind generation												-3575.5408 (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												10227.1826 (238)

10a. Fuel costs - using BEDF prices (595)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	11483.8875	27.6700	3177.5917 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2032.4592	27.6700	562.3815 (247)
Energy for instantaneous electric shower(s)	0.0000	27.6700	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	27.6700	22.1360 (249)
Energy for lighting	204.1976	27.6700	56.5015 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1070.4831	27.6700	-296.2027
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-296.2027 (252)
Wind Turbine electricity used in dwelling	-2502.8785	27.6700	-692.5465
Wind Turbine electricity exported	0.0000	5.8100	0.0000
Total			-692.5465 (252)
Total energy cost			2829.8614 (255)

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	11483.8875	0.1537	1764.6322 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2032.4592	0.1460	296.7964 (264)
Space and water heating			2061.4286 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	204.1976	0.1443	29.4720 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1070.4831	0.1359	-145.4274
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-145.4274 (269)
Wind Turbine electricity used in dwelling	-2502.8785	0.1387	-347.1801
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-347.1801 (269)
Total CO2, kg/year			1609.3901 (272)

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	11483.8875	1.5689	18017.0730 (275)
Total CO2 associated with community systems			0.0000 (473)

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Water heating (other fuel)	2032.4592	1.5402	3130.3567 (278)
Space and water heating			21147.4297 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	204.1976	1.5338	313.2050 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1070.4831	1.5022	-1608.0847
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1608.0847 (283)
Wind Turbine electricity used in dwelling	-2502.8785	1.5128	-3786.3546
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-3786.3546 (283)
Total Primary energy kWh/year			16187.2194 (286)