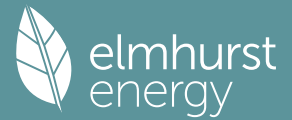


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Property Reference	OCKENDEN	Issued on Date	22/02/2023
Assessment Reference	BASELINE	Prop Type Ref	
Property	Willow Brook, Danworth Lane, Hurstpierpoint, BN6 9LW		
SAP Rating	58 D	DER	TER
Environmental	91 B	% DER < TER	N/A
CO ₂ Emissions (t/year)	0.43	DFEE	TFEE
Compliance Check	See BREL	% DFEE < TFEE	
% DPER < TPER		DPER	TPER
Assessor Details	Mr. Alexander Pelling	Assessor ID	T297-0001
Client	SCANDIA-HUS, Project Manager		

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	28.4400 (1b)	x 3.5100 (2b)	= 99.8244 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.4400		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 99.8244 (5)

2. Ventilation rate

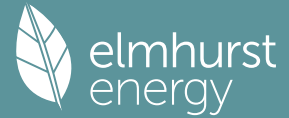
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.2004 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9504 (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) = 0.9504 (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	1.2117	1.1879	1.1642	1.0454	1.0216	0.9028	0.9028	0.8791	0.9504	1.0216	1.0691	1.1167 (22b)
Effective ac	1.2117	1.1879	1.1642	1.0454	1.0216	0.9076	0.9076	0.8864	0.9516	1.0216	1.0691	1.1167 (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 = 1.40)			16.3100	1.3258	21.6231		(27)
Solid Doors			2.1000	1.4000	2.9400		(26)
Heatloss Floor 1			28.4400	0.1800	5.1192	110.0000	3128.4000 (28a)
Timber Cladding (Actis)	101.4800	18.4100	83.0700	0.3000	24.9210	9.0000	747.6300 (29a)
Internal Gables To Loft	9.7000		9.7000	0.2000	1.9400	9.0000	87.3000 (29a)
Rafters	22.6500		22.6500	0.1500	3.3975	9.0000	203.8500 (30)
Joists	6.5000		6.5000	0.1500	0.9750	9.0000	58.5000 (30)
Total net area of external elements A _{um} (A, m ²)			168.7700				(31)

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Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 60.9158 (33)
Internal Wall 1 32.8500 9.0000 295.6500 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 4521.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 158.9778 (35)
Thermal bridges (Default value 0.200 * total exposed area) 33.7540 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 94.6698 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan 39.9158 Feb 39.1332 Mar 38.3505 Apr 34.4372 May 33.6545 Jun 29.8967 Jul 29.8967 Aug 29.1994 Sep 31.3471 Oct 33.6545 Nov 35.2199 Dec 36.7852 (38)
Heat transfer coeff 134.5856 133.8030 133.0203 129.1070 128.3243 124.5665 124.5665 123.8692 126.0169 128.3243 129.8897 131.4550 (39)
Average = Sum(39)m / 12 = 128.9607
HLP Jan 4.7323 Feb 4.7047 Mar 4.6772 Apr 4.5396 May 4.5121 Jun 4.3800 Jul 4.3800 Aug 4.3555 Sep 4.4310 Oct 4.5121 Nov 4.5671 Dec 4.6222 (40)
HLP (average) 4.5345
Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

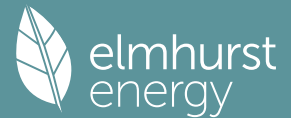
4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.1441 (42)
Hot water usage for mixer showers 54.2523 53.4370 52.2490 49.9758 48.2983 46.4275 45.3642 46.5433 47.8358 49.8444 52.1663 54.0445 (42a)
Hot water usage for baths 18.7875 18.5084 18.1155 17.3910 16.8486 16.2471 15.9221 16.3123 16.7371 17.3808 18.1202 18.7239 (42b)
Hot water usage for other uses 26.3466 25.3885 24.4305 23.4724 22.5143 21.5563 21.5563 22.5143 23.4724 24.4305 25.3885 26.3466 (42c)
Average daily hot water use (litres/day) 91.3892 (43)
Daily hot water use Jan 99.3864 Feb 97.3340 Mar 94.7949 Apr 90.8393 May 87.6612 Jun 84.2309 Jul 82.8426 Aug 85.3699 Sep 88.0453 Oct 91.6556 Nov 95.6750 Dec 99.1150 (44)
Energy content 157.4037 138.6023 145.6963 124.3544 118.0088 103.5717 100.1910 105.7058 108.5686 124.3758 136.3066 155.1901 (45)
Energy content (annual) Total = Sum(45)m = 1517.9751
Distribution loss (46)m = 0.15 x (45)m 23.6106 20.7903 21.8544 18.6532 17.7013 15.5358 15.0286 15.8559 16.2853 18.6564 20.4460 23.2785 (46)
Water storage loss:
Store volume 180.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0115 (51)
Volume factor from Table 2a 0.8736 (52)
Temperature factor from Table 2b 0.5400 (53)
Enter (49) or (54) in (55) 0.9805 (55)
Total storage loss 30.3965 27.4549 30.3965 29.4160 30.3965 29.4160 30.3965 30.3965 29.4160 30.3965 29.4160 30.3965 (56)
If cylinder contains dedicated solar storage 30.3965 27.4549 30.3965 29.4160 30.3965 29.4160 30.3965 30.3965 29.4160 30.3965 29.4160 30.3965 (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 211.0626 187.0684 199.3552 176.2824 171.6677 155.4996 153.8499 159.3647 160.4966 178.0347 188.2346 208.8490 (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 211.0626 187.0684 199.3552 176.2824 171.6677 155.4996 153.8499 159.3647 160.4966 178.0347 188.2346 208.8490 (64)
Total per year (kWh/year) = Sum(64)m = 2149.7652 (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 95.2638 84.8581 91.3711 82.8902 82.1650 75.9799 76.2406 78.0743 77.6414 84.2821 86.8643 94.5278 (65)

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

Metabolic gains (Table 5), Watts Jan 68.6451 Feb 68.6451 Mar 68.6451 Apr 68.6451 May 68.6451 Jun 68.6451 Jul 68.6451 Aug 68.6451 Sep 68.6451 Oct 68.6451 Nov 68.6451 Dec 68.6451 (66)
(66)m 68.6451 68.6451 68.6451 68.6451 68.6451 68.6451 68.6451 68.6451 68.6451 68.6451 68.6451 68.6451 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 11.5020 10.2160 8.3082 6.2898 4.7017 3.9694 4.2891 5.5751 7.4829 9.5012 11.0893 11.8217 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 140.1329 141.5871 137.9227 130.1216 120.2742 111.0190 104.8360 103.3818 107.0462 114.8473 124.6947 133.9499 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 43.0086 43.0086 43.0086 43.0086 43.0086 43.0086 43.0086 43.0086 43.0086 43.0086 43.0086 43.0086 (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) -45.7634 -45.7634 -45.7634 -45.7634 -45.7634 -45.7634 -45.7634 -45.7634 -45.7634 -45.7634 -45.7634 -45.7634 (71)
Water heating gains (Table 5) 128.0428 126.2770 122.8106 115.1253 110.4369 105.5277 102.4739 104.9386 107.8353 113.2823 120.6449 127.0535 (72)
Total internal gains 348.5680 346.9703 337.9318 320.4270 304.3031 286.4064 277.4893 279.7858 288.2547 306.5211 325.3192 341.7154 (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			
North			2.0400	10.6334	0.6300	0.7000	0.7700	6.6294 (74)				
East			8.6300	19.6403	0.6300	0.7000	0.7700	51.8000 (76)				
South			5.6400	46.7521	0.6300	0.7000	0.7700	80.5845 (78)				
Solar gains	139.0140	245.9777	356.5219	467.9689	542.8552	545.7512	523.4267	467.4413	395.5867	277.6689	168.2869	117.7569 (83)
Total gains	487.5820	592.9480	694.4537	788.3959	847.1583	832.1576	800.9160	747.2270	683.8414	584.1901	493.6061	459.4722 (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	9.3318	9.3864	9.4416	9.7278	9.7871	10.0824	10.0824	10.1391	9.9663	9.7871	9.6692	9.5540
alpha	1.6221	1.6258	1.6294	1.6485	1.6525	1.6722	1.6722	1.6759	1.6644	1.6525	1.6446	1.6369
util living area	0.9331	0.9079	0.8700	0.8082	0.7242	0.6123	0.5045	0.5397	0.6971	0.8384	0.9110	0.9384 (86)
MIT	17.2119	17.5540	18.1315	18.9032	19.6139	20.2113	20.5170	20.4680	19.9940	19.0622	18.0216	17.1822 (87)
Th 2	18.1339	18.1398	18.1458	18.1777	18.1845	18.2187	18.2187	18.2254	18.2052	18.1845	18.1711	18.1582 (88)
util rest of house	0.9134	0.8810	0.8301	0.7439	0.6174	0.4311	0.2325	0.2729	0.5358	0.7681	0.8797	0.9202 (89)
MIT 2	15.1028	15.4350	15.9917	16.7314	17.3625	17.8464	18.0093	18.0017	17.7095	16.9137	15.9196	15.0881 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	16.1485	16.4855	17.0526	17.8081	18.4787	19.0189	19.2525	19.2244	18.8421	17.9789	16.9617	16.1263 (92)
Temperature adjustment	0.0000											
adjusted MIT	16.1485	16.4855	17.0526	17.8081	18.4787	19.0189	19.2525	19.2244	18.8421	17.9789	16.9617	16.1263 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8937	0.8593	0.8096	0.7330	0.6312	0.4937	0.3517	0.3879	0.5820	0.7612	0.8607	0.9013 (94)
Useful gains	435.7419	509.5000	562.1976	577.9224	534.7347	410.8015	281.6807	289.8237	398.0298	444.7087	424.8589	414.1280 (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	1594.6333	1550.1811	1403.7041	1150.0978	869.8696	550.4436	330.4172	349.8617	597.5840	946.8901	1280.9371	1567.7747 (97)
Space heating kWh	862.2152	699.3377	626.0808	411.9663	249.3404	0.0000	0.0000	0.0000	0.0000	373.6230	616.3763	858.3132 (98a)
Space heating requirement - total per year (kWh/year)	4697.2529											
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	862.2152	699.3377	626.0808	411.9663	249.3404	0.0000	0.0000	0.0000	0.0000	373.6230	616.3763	858.3132 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4697.2529											
Space heating per m2	(98c) / (4) = 165.1636 (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 %)												249.9000 (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	862.2152	699.3377	626.0808	411.9663	249.3404	0.0000	0.0000	0.0000	0.0000	373.6230	616.3763	858.3132 (98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating fuel (main heating system)	345.0241	279.8470	250.5325	164.8525	99.7761	0.0000	0.0000	0.0000	0.0000	149.5090	246.6492	343.4626 (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	211.0626	187.0684	199.3552	176.2824	171.6677	155.4996	153.8499	159.3647	160.4966	178.0347	188.2346	208.8490 (64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	120.5383	106.8352	113.8522	100.6752	98.0398	88.8062	87.8640	91.0135	91.6600	101.6760	107.5012	119.2741 (219)
Space cooling fuel requirement												

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(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	10.0676	8.0766	7.2721	5.3279	4.1154	3.3623	3.7542	4.8798	6.3384	8.3164	9.3933	10.3474	(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												1879.6530	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												1227.7357	(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)												81.2515	(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												3188.6402	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1879.6530	16.4900	309.9548	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1227.7357	16.4900	202.4536	(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	81.2515	16.4900	13.3984	(250)
Additional standing charges			0.0000	(251)
Total energy cost			525.8068	(255)

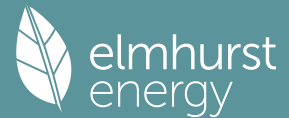
11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	2.5775	(257)
SAP value		58.2190	
SAP rating (Section 12)		58	(258)
SAP band		D	

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	1879.6530	0.1541	289.6519	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1227.7357	0.1407	172.7865	(264)
Space and water heating			462.4385	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	81.2515	0.1443	11.7271	(268)
Total CO2, kg/year			474.1656	(272)
CO2 emissions per m2			16.6700	(273)
EI value			91.3483	
EI rating			91	(274)
EI band			B	

Full SAP Calculation Printout



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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	28.4400 (1b)	3.5100 (2b)	99.8244 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	99.8244 (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) = 0.2004 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9504 (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) = 0.9504 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)
Adj infilt rate	0.9741	0.9028	0.8791	0.8316	0.8316	0.7603	0.7840	0.7365	0.7365	0.8078	0.7840	0.8791 (22b)
Effective ac	0.9744	0.9076	0.8864	0.8457	0.8457	0.7890	0.8074	0.7712	0.7712	0.8263	0.8074	0.8864 (25)

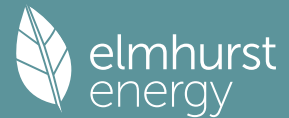
3. Heat losses and heat loss parameter

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 = 1.40)			16.3100	1.3258	21.6231		(27)
Solid Doors			2.1000	1.4000	2.9400		(26)
Heatloss Floor 1			28.4400	0.1800	5.1192	110.0000	3128.4000 (28a)
Timber Cladding (Actis)	101.4800	18.4100	83.0700	0.3000	24.9210	9.0000	747.6300 (29a)
Internal Gables To Loft	9.7000		9.7000	0.2000	1.9400	9.0000	87.3000 (29a)
Rafters	22.6500		22.6500	0.1500	3.3975	9.0000	203.8500 (30)
Joists	6.5000		6.5000	0.1500	0.9750	9.0000	58.5000 (30)
Total net area of external elements Aum(A, m ²)			168.7700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.9158		(33)
Internal Wall 1			32.8500			9.0000	295.6500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	4521.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							158.9778 (35)
Thermal bridges (Default value 0.200 * total exposed area)							33.7540 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	94.6698 (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	32.1002	29.8967	29.1994	27.8606	27.8606	25.9917	26.5961	25.4060	25.4060	27.2190	26.5961	29.1994 (38)
Heat transfer coeff	126.7700	124.5665	123.8692	122.5304	122.5304	120.6615	121.2659	120.0758	120.0758	121.8888	121.2659	123.8692 (39)
Average = Sum(39)m / 12 =												122.4475
HLP	4.4575	4.3800	4.3555	4.3084	4.3084	4.2427	4.2639	4.2221	4.2221	4.2858	4.2639	4.3555 (40)
HLP (average)												4.3055
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												1.1441 (42)
Hot water usage for mixer showers												
54.2523	53.4370	52.2490	49.9758	48.2983	46.4275	45.3642	46.5433	47.8358	49.8444	52.1663	54.0445 (42a)	
Hot water usage for baths												
18.7875	18.5084	18.1155	17.3910	16.8486	16.2471	15.9221	16.3123	16.7371	17.3808	18.1202	18.7239 (42b)	
Hot water usage for other uses												
26.3466	25.3885	24.4305	23.4724	22.5143	21.5563	21.5563	22.5143	23.4724	24.4305	25.3885	26.3466 (42c)	
Average daily hot water use (litres/day)												91.3892 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
99.3864	97.3340	94.7949	90.8393	87.6612	84.2309	82.8426	85.3699	88.0453	91.6556	95.6750	99.1150 (44)	
Energy content (annual)	157.4037	138.6023	145.6963	124.3544	118.0088	103.5717	100.1910	105.7058	108.5686	124.3758	136.3066	155.1901 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1517.9751
23.6106	20.7903	21.8544	18.6532	17.7013	15.5358	15.0286	15.8559	16.2853	18.6564	20.4460	23.2785 (46)	
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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												
211.0626	187.0684	199.3552	176.2824	171.6677	155.4996	153.8499	159.3647	160.4966	178.0347	188.2346	208.8490 (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	211.0626	187.0684	199.3552	176.2824	171.6677	155.4996	153.8499	159.3647	160.4966	178.0347	188.2346	208.8490 (64)
											Total per year (kWh/year) = Sum(64)m = 2149.7652 (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	95.2638	84.8581	91.3711	82.8902	82.1650	75.9799	76.2406	78.0743	77.6414	84.2821	86.8643	94.5278 (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	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	11.5020	10.2160	8.3082	6.2898	4.7017	3.9694	4.2891	5.5751	7.4829	9.5012	11.0893	11.8217 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	140.1329	141.5871	137.9227	130.1216	120.2742	111.0190	104.8360	103.3818	107.0462	114.8473	124.6947	133.9499 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086 (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)												
	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634 (71)
Water heating gains (Table 5)												
	128.0428	126.2770	122.8106	115.1253	110.4369	105.5277	102.4739	104.9386	107.8353	113.2823	120.6449	127.0535 (72)
Total internal gains												
	348.5680	346.9703	337.9318	320.4270	304.3031	286.4064	277.4893	279.7858	288.2547	306.5211	325.3192	341.7154 (73)

6. Solar gains

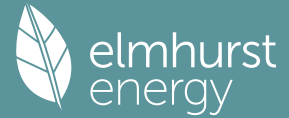
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.0400	12.6762	0.6300	0.7000	0.7700	7.9030 (74)
East	8.6300	23.6925	0.6300	0.7000	0.7700	62.4875 (76)
South	5.6400	53.2576	0.6300	0.7000	0.7700	91.7979 (78)

Solar gains	162.1883	255.4439	369.8588	507.6920	572.3471	624.4035	586.4059	524.1878	440.0147	308.6102	198.3080	138.1558 (83)
Total gains	510.7563	602.4142	707.7906	828.1190	876.6502	910.8099	863.8952	803.9736	728.2695	615.1313	523.6272	479.8712 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
9.9071	10.0824	10.1391	10.2499	10.2499	10.4087	10.3568	10.4594	10.4594	10.3039	10.3568	10.1391	
1.6605	1.6722	1.6759	1.6833	1.6833	1.6939	1.6905	1.6973	1.6973	1.6869	1.6905	1.6759	

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util living area	0.9222	0.8982	0.8537	0.7803	0.6801	0.5386	0.4438	0.4477	0.6461	0.8003	0.8918	0.9280 (86)
MIT	17.5505	17.8406	18.4370	19.1562	19.8660	20.3962	20.6043	20.6150	20.1750	19.4131	18.3938	17.5421 (87)
Th 2	18.1983	18.2187	18.2254	18.2385	18.2385	18.2574	18.2512	18.2634	18.2634	18.2449	18.2512	18.2254 (88)
util rest of house	0.8988	0.8683	0.8086	0.7081	0.5569	0.3388	0.1679	0.1529	0.4673	0.7106	0.8531	0.9062 (89)
MIT 2	15.4699	15.7580	16.3282	16.9941	17.6002	17.9775	18.0615	18.0783	17.8714	17.2642	16.3234	15.4791 (90)
Living area fraction									fLA = Living area / (4) =			0.4958 (91)
MIT	16.5014	16.7905	17.3737	18.0660	18.7235	19.1766	19.3222	19.3360	19.0135	18.3296	17.3499	16.5019 (92)
Temperature adjustment												0.0000
adjusted MIT	16.5014	16.7905	17.3737	18.0660	18.7235	19.1766	19.3222	19.3360	19.0135	18.3296	17.3499	16.5019 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8787	0.8471	0.7903	0.7025	0.5830	0.4167	0.2912	0.2863	0.5270	0.7142	0.8355	0.8868	(94)
Useful gains	448.8128	510.3331	559.3950	581.7204	511.1101	379.5109	251.5973	230.1523	383.8188	439.3288	437.4933	425.5495	(95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000	(96)
Heat loss rate W	1458.0368	1418.8780	1272.5932	1061.8515	762.5694	467.7593	281.6013	256.4797	529.9539	820.2594	1145.9482	1424.7285	(97)
Space heating kWh	750.8627	610.5422	530.6195	345.6944	187.0857	0.0000	0.0000	0.0000	0.0000	283.4124	510.0876	743.3892	(98a)
Space heating requirement - total per year (kWh/year)												3961.6936	
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	750.8627	610.5422	530.6195	345.6944	187.0857	0.0000	0.0000	0.0000	0.0000	283.4124	510.0876	743.3892	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3961.6936	
Space heating per m2										(98c) / (4) =		139.3001	(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 %)													249.9000 (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	750.8627	610.5422	530.6195	345.6944	187.0857	0.0000	0.0000	0.0000	0.0000	283.4124	510.0876	743.3892	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	300.4652	244.3146	212.3327	138.3331	74.8642	0.0000	0.0000	0.0000	0.0000	113.4103	204.1167	297.4747	(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	211.0626	187.0684	199.3552	176.2824	171.6677	155.4996	153.8499	159.3647	160.4966	178.0347	188.2346	208.8490	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	120.5383	106.8352	113.8522	100.6752	98.0398	88.8062	87.8640	91.0135	91.6600	101.6760	107.5012	119.2741	(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	10.0676	8.0766	7.2721	5.3279	4.1154	3.3623	3.7542	4.8798	6.3384	8.3164	9.3933	10.3474	(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												1585.3115	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												1227.7357	(219)
Space cooling fuel												0.0000	(221)

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Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	81.2515 (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	2894.2988 (238)

10a. Fuel costs - using BEDF prices (511)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1585.3115	18.3900	291.5388 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1227.7357	18.3900	225.7806 (247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	81.2515	18.3900	14.9422 (250)
Additional standing charges			0.0000 (251)
Total energy cost			532.2615 (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	1585.3115	0.1545	244.9506 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1227.7357	0.1407	172.7865 (264)
Space and water heating			417.7371 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	81.2515	0.1443	11.7271 (268)
Total CO2, kg/year			429.4642 (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	1585.3115	1.5720	2492.1812 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1227.7357	1.5204	1866.6279 (278)
Space and water heating			4358.8091 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	81.2515	1.5338	124.6263 (282)
Total Primary energy kWh/year			4483.4354 (286)

SAP 10 EPC IMPROVEMENTS

BASELINE

Current energy efficiency rating:	D 58
Current environmental impact rating:	B 91

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	+ 3.8	-£ 63	-43 kg (9.9%)
U Solar photovoltaic panels	+ 9.4	-£ 136	-102 kg (26.3%)
V2 Wind turbine	+ 29.3	-£ 406	-313 kg (109.9%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar water heating	£63	1.50 kg/m²	D 62 A 92
Solar photovoltaic panels	£136	3.58 kg/m²	C 71 A 94
Wind turbine	£406	11.02 kg/m²	A 101 A 100
Total Savings	£605	16.09 kg/m²	

Potential energy efficiency rating:	A 101
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Potential environmental impact rating:

A 100

Fuel prices for cost data on this page from database revision number 511 TEST (31 Jan 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

Electricity	Current £532	Potential £470	Saving £63
Space heating	£292	£307	-£15
Water heating	£226	£148	£78
Lighting	£15	£15	£0
Generated (PV)	-£0	-£136	£136
Generated (wind)	-£0	-£406	£406
Total cost of fuels	£532	-£72	£605
Total cost of uses	£533	-£72	£605
Delivered energy	102 kWh/m ²	-14 kWh/m ²	116 kWh/m ²
Carbon dioxide emissions	0.4 tonnes	-0.0 tonnes	0.5 tonnes
CO2 emissions per m ²	15 kg/m ²	-1 kg/m ²	16 kg/m ²
Primary energy	158 kWh/m ²	-18 kWh/m ²	175 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	28.4400 (1b)	x 3.5100 (2b)	= 99.8244 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 99.8244 (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)

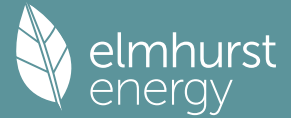
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test		20.0000 / (5) = 0.2004 (8)
Pressure Test Method		No
Measured/design AP50		Blower Door
Infiltration rate		15.0000 (17)
Number of sides sheltered		0.9504 (18)
		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.9504 (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	1.2117	1.1879	1.1642	1.0454	1.0216	0.9028	0.9028	0.8791	0.9504	1.0216	1.0691	1.1167 (22b)
Effective ac	1.2117	1.1879	1.1642	1.0454	1.0216	0.9076	0.9076	0.8864	0.9516	1.0216	1.0691	1.1167 (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 = 1.40)			16.3100	1.3258	21.6231		(27)
Solid Doors			2.1000	1.4000	2.9400		(26)
Heatloss Floor 1			28.4400	0.1800	5.1192	110.0000	3128.4000 (28a)
Timber Cladding (Actis)	101.4800	18.4100	83.0700	0.3000	24.9210	9.0000	747.6300 (29a)

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Internal Gables To Loft	9.7000	9.7000	0.2000	1.9400	9.0000	87.3000 (29a)
Rafters	22.6500	22.6500	0.1500	3.3975	9.0000	203.8500 (30)
Joists	6.5000	6.5000	0.1500	0.9750	9.0000	58.5000 (30)
Total net area of external elements Aum(A, m2)		168.7700				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	60.9158			(33)
Internal Wall 1		32.8500		9.0000		295.6500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	4521.3300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		158.9778 (35)
Thermal bridges (Default value 0.200 * total exposed area)		33.7540 (36)
Point Thermal Bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	94.6698 (37)

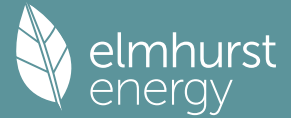
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	39.9158	39.1332	38.3505	34.4372	33.6545	29.8967	29.8967	29.1994	31.3471	33.6545	35.2199	36.7852 (38)
Average = Sum(39)m / 12 =	134.5856	133.8030	133.0203	129.1070	128.3243	124.5665	124.5665	123.8692	126.0169	128.3243	129.8897	131.4550 (39)
	128.9607											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	4.7323	4.7047	4.6772	4.5396	4.5121	4.3800	4.3800	4.3555	4.4310	4.5121	4.5671	4.6222 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.1441 (42)
Hot water usage for mixer showers	54.2523	53.4370	52.2490	49.9758	48.2983	46.4275	45.3642	46.5433	47.8358	49.8444	52.1663	54.0445 (42a)
Hot water usage for baths	18.7875	18.5084	18.1155	17.3910	16.8486	16.2471	15.9221	16.3123	16.7371	17.3808	18.1202	18.7239 (42b)
Hot water usage for other uses	26.3466	25.3885	24.4305	23.4724	22.5143	21.5563	21.5563	22.5143	23.4724	24.4305	25.3885	26.3466 (42c)
Average daily hot water use (litres/day)												91.3892 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	99.3864	97.3340	94.7949	90.8393	87.6612	84.2309	82.8426	85.3699	88.0453	91.6556	95.6750	99.1150 (44)
Energy content (annual)	157.4037	138.6023	145.6963	124.3544	118.0088	103.5717	100.1910	105.7058	108.5686	124.3758	136.3066	155.1901 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1517.9751
Distribution loss	23.6106	20.7903	21.8544	18.6532	17.7013	15.5358	15.0286	15.8559	16.2853	18.6564	20.4460	23.2785 (46)
Water storage loss:												180.0000 (47)
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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	211.0626	187.0684	197.9594	169.5288	158.8734	142.8929	140.8229	147.2682	155.0937	176.6389	188.2346	208.8490 (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)
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)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												584.4661 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												584.4661
Solar input	-0.0000	-16.2785	-56.3923	-75.8892	-96.7814	-88.9461	-88.1646	-78.2332	-55.3656	-28.4153	-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	211.0626	170.7899	141.5671	93.6396	62.0920	53.9469	52.6584	69.0350	99.7281	148.2236	188.2346	208.8490 (64)
												1499.8267 (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	95.2638	84.8581	90.2545	77.4873	71.9296	65.8946	65.8190	68.3971	73.3191	83.1655	86.8643	94.5278 (65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	11.5020	10.2160	8.3082	6.2898	4.7017	3.9694	4.2891	5.5751	7.4829	9.5012	11.0893	11.8217	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	140.1329	141.5871	137.9227	130.1216	120.2742	111.0190	104.8360	103.3818	107.0462	114.8473	124.6947	133.9499	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	(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)	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	(71)
Water heating gains (Table 5)	128.0428	126.2770	121.3098	107.6213	96.6796	91.5202	88.4665	91.9316	101.8321	111.7815	120.6449	127.0535	(72)
Total internal gains	348.5680	346.9703	336.4310	312.9230	290.5458	272.3989	263.4818	266.7788	282.2515	305.0203	325.3192	341.7154	(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			2.0400	10.6334	0.6300	0.7000	0.7700	6.6294 (74)				
East			8.6300	19.6403	0.6300	0.7000	0.7700	51.8000 (76)				
South			5.6400	46.7521	0.6300	0.7000	0.7700	80.5845 (78)				
Solar gains	139.0140	245.9777	356.5219	467.9689	542.8552	545.7512	523.4267	467.4413	395.5867	277.6689	168.2869	117.7569 (83)
Total gains	487.5820	592.9480	692.9529	780.8919	833.4010	818.1502	786.9085	734.2201	677.8382	582.6893	493.6061	459.4722 (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)													
tau	9.3318	9.3864	9.4416	9.7278	9.7871	10.0824	10.0824	10.1391	9.9663	9.7871	9.6692	9.5540	
alpha	1.6221	1.6258	1.6294	1.6485	1.6525	1.6722	1.6722	1.6759	1.6644	1.6525	1.6446	1.6369	
util living area	0.9331	0.9079	0.8704	0.8103	0.7286	0.6176	0.5102	0.5454	0.6997	0.8389	0.9110	0.9384	(86)
MIT	17.2119	17.5540	18.1293	18.8940	19.6009	20.2024	20.5114	20.4619	19.9888	19.0601	18.0216	17.1822	(87)
Th 2	18.1339	18.1398	18.1458	18.1777	18.1845	18.2187	18.2187	18.2254	18.2052	18.1845	18.1711	18.1582	(88)
util rest of house	0.9134	0.8810	0.8306	0.7464	0.6225	0.4363	0.2362	0.2770	0.5386	0.7688	0.8797	0.9202	(89)
MIT 2	15.1028	15.4350	15.9898	16.7239	17.3537	17.8426	18.0084	18.0005	17.7067	16.9121	15.9196	15.0881	(90)
Living area fraction	16.1485	16.4855	17.0505	17.7998	18.4678	19.0125	19.2494	19.2208	18.8381	17.9771	16.9617	16.1263	(92)
MIT	16.1485	16.4855	17.0505	17.7998	18.4678	19.0125	19.2494	19.2208	18.8381	17.9771	16.9617	16.1263	(93)
Temperature adjustment													
adjusted MIT	16.1485	16.4855	17.0505	17.7998	18.4678	19.0125	19.2494	19.2208	18.8381	17.9771	16.9617	16.1263	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.8937	0.8593	0.8100	0.7354	0.6358	0.4986	0.3563	0.3926	0.5846	0.7618	0.8607	0.9013	(94)
Ext temp.	435.7419	509.5000	561.2790	574.2340	529.8542	407.9421	280.3374	288.2740	396.2624	443.9096	424.8589	414.1280	(95)
Heat loss rate W	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)
Space heating kWh	1594.6333	1550.1811	1403.4334	1149.0214	868.4733	549.6536	330.0213	349.4149	597.0855	946.6570	1280.9371	1567.7747	(97)
Space heating requirement - total per year (kWh/year)	862.2152	699.3377	626.5628	413.8470	251.9326	0.0000	0.0000	0.0000	0.0000	374.0441	616.3763	858.3132	(98a)
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)	862.2152	699.3377	626.5628	413.8470	251.9326	0.0000	0.0000	0.0000	0.0000	374.0441	616.3763	858.3132	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	862.2152	699.3377	626.5628	413.8470	251.9326	0.0000	0.0000	0.0000	0.0000	374.0441	616.3763	858.3132	(98c)
Space heating per m2													(98c) / (4) =
													165.3526 (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 %)													249.9000 (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												

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Space heating efficiency (main heating system 1)	862.2152	699.3377	626.5628	413.8470	251.9326	0.0000	0.0000	0.0000	0.0000	374.0441	616.3763	858.3132 (98)
Space heating fuel (main heating system)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)
Space heating efficiency (main heating system 2)	345.0241	279.8470	250.7254	165.6050	100.8134	0.0000	0.0000	0.0000	0.0000	149.6775	246.6492	343.4626 (211)
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 (212)
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)
Water heating requirement	211.0626	170.7899	141.5671	93.6396	62.0920	53.9469	52.6584	69.0350	99.7281	148.2236	188.2346	208.8490 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	120.5383	97.5385	80.8493	53.4778	35.4609	30.8092	30.0733	39.4261	56.9550	84.6508	107.5012	119.2741 (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	10.0676	8.0766	7.2721	5.3279	4.1154	3.3623	3.7542	4.8798	6.3384	8.3164	9.3933	10.3474 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-37.5339	-55.3641	-81.1149	-88.6745	-87.1864	-59.7391	-59.0064	-58.9246	-56.8414	-60.9869	-41.6362	-32.1560 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-212.5732	-192.0016	-212.5732	-205.7160	-212.5732	-134.6559	-133.0613	-142.4578	-160.9175	-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												1881.8043 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.1000
Water heating fuel used												856.5544 (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)												81.2515 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-719.1645 (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												-56.9467 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1881.8043	16.4900	310.3095 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	856.5544	16.4900	141.2458 (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	81.2515	16.4900	13.3984 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-719.1645	16.4900	-118.5902
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-118.5902 (252)
Wind Turbine electricity used in dwelling	-2237.3924	16.4900	-368.9460
Wind Turbine electricity exported	0.0000	5.5900	0.0000
Total			-368.9460 (252)
Total energy cost			-9.3905 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = -0.0460 (257)

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SAP value
SAP rating (Section 12)
SAP band

100.7462
101 (258)
A

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	1881.8043	0.1541	289.9489 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	856.5544	0.1466	125.5383 (264)
Space and water heating			415.4872 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	81.2515	0.1443	11.7271 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-719.1645	0.1372	-98.6513
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-98.6513 (269)
Wind Turbine electricity used in dwelling	-2237.3924	0.1415	-316.5087
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-316.5087 (269)
Total CO2, kg/year			23.1514 (272)
CO2 emissions per m2			0.8100 (273)
EI value			99.5776
EI rating			100 (274)
EI band			A

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	28.4400 (1b)	x 3.5100 (2b)	= 99.8244 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	28.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	99.8244 (5)

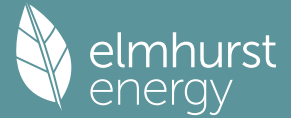
2. Ventilation rate

	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)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 20.0000 / (5) =	0.2004 (8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000 (17)	
Infiltration rate		0.9504 (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) =	0.9504 (21)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)
Adj infiltr rate	0.9741	0.9028	0.8791	0.8316	0.8316	0.7603	0.7840	0.7365	0.7365	0.8078	0.7840	0.8791 (22b)
Effective ac	0.9744	0.9076	0.8864	0.8457	0.8457	0.7890	0.8074	0.7712	0.7712	0.8263	0.8074	0.8864 (25)

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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	
Windows (Uw = 1.40)			16.3100	1.3258	21.6231			(27)
Solid Doors			2.1000	1.4000	2.9400			(26)
Heatloss Floor 1			28.4400	0.1800	5.1192	110.0000	3128.4000	(28a)
Timber Cladding (Actis)	101.4800	18.4100	83.0700	0.3000	24.9210	9.0000	747.6300	(29a)
Internal Gables To Loft	9.7000		9.7000	0.2000	1.9400	9.0000	87.3000	(29a)
Rafters	22.6500		22.6500	0.1500	3.3975	9.0000	203.8500	(30)
Joists	6.5000		6.5000	0.1500	0.9750	9.0000	58.5000	(30)
Total net area of external elements Aum(A, m2)			168.7700					(31)
Fabric heat loss, W/K = Sum (A x U)					60.9158			(32)
Internal Wall 1			32.8500			9.0000	295.6500	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 4521.3300 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 158.9778 (35)
 Thermal bridges (Default value 0.200 * total exposed area) 33.7540 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 94.6698 (37)

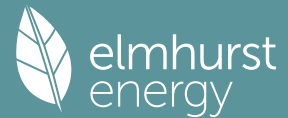
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 32.1002	Feb 29.8967	Mar 29.1994	Apr 27.8606	May 27.8606	Jun 25.9917	Jul 26.5961	Aug 25.4060	Sep 25.4060	Oct 27.2190	Nov 26.5961	Dec 29.1994	(38)
Heat transfer coeff	126.7700	124.5665	123.8692	122.5304	122.5304	120.6615	121.2659	120.0758	120.0758	121.8888	121.2659	123.8692	(39)
Average = Sum(39)m / 12 =												122.4475	

HLP	Jan 4.4575	Feb 4.3800	Mar 4.3555	Apr 4.3084	May 4.3084	Jun 4.2427	Jul 4.2639	Aug 4.2221	Sep 4.2221	Oct 4.2858	Nov 4.2639	Dec 4.3555	(40)
HLP (average)												4.3055	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.1441 (42)
Hot water usage for mixer showers													
54.2523	53.4370	52.2490	49.9758	48.2983	46.4275	45.3642	46.5433	47.8358	49.8444	52.1663	54.0445	54.0445	(42a)
Hot water usage for baths													
18.7875	18.5084	18.1155	17.3910	16.8486	16.2471	15.9221	16.3123	16.7371	17.3808	18.1202	18.7239	18.7239	(42b)
Hot water usage for other uses													
26.3466	25.3885	24.4305	23.4724	22.5143	21.5563	21.5563	22.5143	23.4724	24.4305	25.3885	26.3466	26.3466	(42c)
Average daily hot water use (litres/day)												91.3892	(43)
Daily hot water use	Jan 99.3864	Feb 97.3340	Mar 94.7949	Apr 90.8393	May 87.6612	Jun 84.2309	Jul 82.8426	Aug 85.3699	Sep 88.0453	Oct 91.6556	Nov 95.6750	Dec 99.1150	(44)
Energy conte	157.4037	138.6023	145.6963	124.3544	118.0088	103.5717	100.1910	105.7058	108.5686	124.3758	136.3066	155.1901	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
23.6106	20.7903	21.8544	18.6532	17.7013	15.5358	15.0286	15.8559	16.2853	18.6564	20.4460	23.2785	23.2785	(46)
Water storage loss:													
Store volume												180.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115	(51)
Volume factor from Table 2a												0.8736	(52)
Temperature factor from Table 2b												0.5400	(53)
Enter (49) or (54) in (55)												0.9805	(55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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	211.0626	187.0684	197.9594	169.5288	158.8734	142.8929	140.8229	147.2682	155.0937	176.6389	188.2346	208.8490	(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)
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)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												675.3517	(H24)
Heat delivered to space heating												0.0000	(H29)
Solar input												675.3517	
Solar input	-0.9616	-19.6765	-61.5863	-85.4385	-103.7536	-102.7317	-99.6039	-90.5774	-66.0740	-38.2224	-6.7258	-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	210.1010	167.3918	136.3731	84.0903	55.1198	40.1612	41.2190	56.6908	89.0197	138.4165	181.5088	208.8490	(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 per year (kWh/year) = Sum(64)m =												1408.9411	(64)

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Heat gains from water heating, kWh/month
 95.2638 84.8581 90.2545 77.4873 71.9296 65.8946 65.8190 68.3971 73.3191 83.1655 86.8643 94.5278 (65)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

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	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	68.6451	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	11.5020	10.2160	8.3082	6.2898	4.7017	3.9694	4.2891	5.5751	7.4829	9.5012	11.0893	11.8217	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	140.1329	141.5871	137.9227	130.1216	120.2742	111.0190	104.8360	103.3818	107.0462	114.8473	124.6947	133.9499	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	43.0086	(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)	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	-45.7634	(71)
Water heating gains (Table 5)	128.0428	126.2770	121.3098	107.6213	96.6796	91.5202	88.4665	91.9316	101.8321	111.7815	120.6449	127.0535	(72)
Total internal gains	348.5680	346.9703	336.4310	312.9230	290.5458	272.3989	263.4818	266.7788	282.2515	305.0203	325.3192	341.7154	(73)

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	
North	2.0400	12.6762	0.6300	0.7000	0.7700	0.7700	7.9030	(74)
East	8.6300	23.6925	0.6300	0.7000	0.7700	0.7700	62.4875	(76)
South	5.6400	53.2576	0.6300	0.7000	0.7700	0.7700	91.7979	(78)

Solar gains	162.1883	255.4439	369.8588	507.6920	572.3471	624.4035	586.4059	524.1878	440.0147	308.6102	198.3080	138.1558	(83)
Total gains	510.7563	602.4142	706.2898	820.6150	862.8929	896.8024	849.8877	790.9667	722.2663	613.6305	523.6272	479.8712	(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)
tau	9.9071	10.0824	10.1391	10.2499	10.2499	10.4087	10.3568	10.4594	10.4594	10.3039	10.3568	10.1391	
alpha	1.6605	1.6722	1.6759	1.6833	1.6833	1.6939	1.6905	1.6973	1.6973	1.6869	1.6905	1.6759	
util living area	0.9222	0.8982	0.8541	0.7826	0.6848	0.5437	0.4488	0.4528	0.6486	0.8008	0.8918	0.9280	(86)
MIT	17.5505	17.8406	18.4348	19.1475	19.8546	20.3896	20.6002	20.6111	20.1706	19.4113	18.3938	17.5421	(87)
Th 2	18.1983	18.2187	18.2254	18.2385	18.2385	18.2574	18.2512	18.2634	18.2634	18.2449	18.2512	18.2254	(88)
util rest of house	0.8988	0.8683	0.8091	0.7107	0.5620	0.3430	0.1705	0.1553	0.4699	0.7113	0.8531	0.9062	(89)
MIT 2	15.4699	15.7580	16.3263	16.9873	17.5932	17.9754	18.0611	18.0781	17.8694	17.2628	16.3234	15.4791	(90)
Living area fraction	16.5014	16.7905	17.3717	18.0583	18.7143	19.1723	19.3200	19.3339	19.0103	18.3280	17.3499	16.5019	(91)
MIT	16.5014	16.7905	17.3717	18.0583	18.7143	19.1723	19.3200	19.3339	19.0103	18.3280	17.3499	16.5019	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.5014	16.7905	17.3717	18.0583	18.7143	19.1723	19.3200	19.3339	19.0103	18.3280	17.3499	16.5019	(93)

8. Space heating requirement

Utilisation	0.8787	0.8471	0.7908	0.7048	0.5876	0.4210	0.2950	0.2900	0.5295	0.7148	0.8355	0.8868	(94)
Useful gains	448.8128	510.3331	558.5298	578.3873	507.0578	377.5884	250.7311	229.3764	382.4219	438.6396	437.4933	425.5495	(95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000	(96)
Heat loss rate W	1458.0368	1418.8780	1272.3437	1060.9001	761.4427	467.2354	281.3326	256.2313	529.5702	820.0627	1145.9482	1424.7285	(97)
Space heating kWh	750.8627	610.5422	531.0775	347.4092	189.2624	0.0000	0.0000	0.0000	0.0000	283.7788	510.0876	743.3892	(98a)
Space heating requirement - total per year (kWh/year)												3966.4095	
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	750.8627	610.5422	531.0775	347.4092	189.2624	0.0000	0.0000	0.0000	0.0000	283.7788	510.0876	743.3892	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3966.4095	
Space heating per m2												(98c) / (4) =	139.4659 (99)

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

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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 %)													249.9000 (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	750.8627	610.5422	531.0775	347.4092	189.2624	0.0000	0.0000	0.0000	0.0000	283.7788	510.0876	743.3892	(98)
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000	(210)
Space heating fuel (main heating system)	300.4652	244.3146	212.5160	139.0193	75.7352	0.0000	0.0000	0.0000	0.0000	113.5569	204.1167	297.4747	(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	210.1010	167.3918	136.3731	84.0903	55.1198	40.1612	41.2190	56.6908	89.0197	138.4165	181.5088	208.8490	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	119.9892	95.5978	77.8830	48.0242	31.4791	22.9361	23.5403	32.3762	50.8393	79.0500	103.6601	119.2741	(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	10.0676	8.0766	7.2721	5.3279	4.1154	3.3623	3.7542	4.8798	6.3384	8.3164	9.3933	10.3474	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-42.7248	-56.6988	-81.7032	-89.8266	-83.9626	-59.3761	-58.8100	-59.4962	-58.7936	-63.7542	-47.1046	-36.8699	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	-212.5732	-192.0016	-212.5732	-205.7160	-212.5732	-126.7829	-126.5282	-135.4080	-154.8018	-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												1587.1987	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.1000	
Water heating fuel used												804.6494	(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)												81.2515	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-739.1205	(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												-395.8418	(238)

10a. Fuel costs - using BEDF prices (511)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1587.1987	18.3900	291.8858 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	804.6494	18.3900	147.9750 (247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	18.3900	14.7120 (249)
Energy for lighting	81.2515	18.3900	14.9422 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-739.1205	18.3900	-135.9243
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-135.9243 (252)
Wind Turbine electricity used in dwelling	-2209.8209	18.3900	-406.3861
Wind Turbine electricity exported	0.0000	5.8100	0.0000
Total			-406.3861 (252)
Total energy cost			-72.7953 (255)

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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	1587.1987	0.1545	245.2117 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	804.6494	0.1477	118.8317 (264)
Space and water heating			364.0433 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	81.2515	0.1443	11.7271 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-739.1205	0.1377	-101.7474
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-101.7474 (269)
Wind Turbine electricity used in dwelling	-2209.8209	0.1418	-313.3031
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-313.3031 (269)
Total CO2, kg/year			-28.1831 (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	1587.1987	1.5720	2495.0342 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	804.6494	1.5464	1244.2827 (278)
Space and water heating			3739.3169 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	81.2515	1.5338	124.6263 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-739.1205	1.5090	-1115.3216
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1115.3216 (283)
Wind Turbine electricity used in dwelling	-2209.8209	1.5243	-3368.4793
Wind Turbine electricity exported	0.0000	0.0000	0.0000
Total			-3368.4793 (283)
Total Primary energy kWh/year			-498.8337 (286)