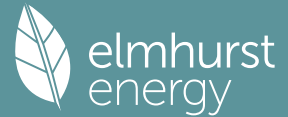


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Property Reference	Plot 6			Issued on Date	15/10/2025
Assessment Reference	As-Built	Prop Type Ref			
Property	9 Forge Close, Caversham, READING, RG4 8BG				
SAP Rating	85 B	DER	3.48	TER	9.95
Environmental	97 A	% DER < TER			65.03
CO ₂ Emissions (t/year)	0.32	DFEE	30.48	TFEE	30.89
Compliance Check	See BREL	% DFEE < TFEE			1.31
% DPER < TPER	29.97	DPER	36.31	TPER	51.85
Assessor Details	Miss Charlotte Rasinsky			Assessor ID	ED74-0001
Client	Country Estates, Country Estates				

SAP 10 WORKSHEET FOR New Build (As Built) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	35.3200 (1b)	x 2.4000 (2b)	= 84.7680 (1b) - (3b)
First floor	34.4500 (1c)	x 2.7000 (2c)	= 93.0150 (1c) - (3c)
Second floor	31.8400 (1d)	x 2.1400 (2d)	= 68.1376 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	101.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	245.9206 (5)

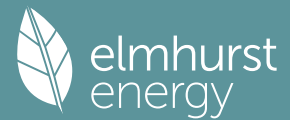
2. Ventilation rate

												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												0 * 10 =	0.0000 (7a)
Number of passive vents												0 * 10 =	0.0000 (7b)
Number of flueless gas fires												0 * 40 =	0.0000 (7c)
												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												0.0000 / (5) =	0.0000 (8)
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												3.5900	(17)
Infiltration rate												0.1795	(18)
Number of sides sheltered												2	(19)
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.1526 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1945	0.1907	0.1869	0.1678	0.1640	0.1449	0.1449	0.1411	0.1526	0.1640	0.1716	0.1793	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			9.1000	1.1450	10.4198		(27)
Bifold Door			9.5900	1.5038	14.4211		(27)
Front Door			1.9100	1.6000	3.0560		(26)
Heatloss Floor 1			35.3200	0.1200	4.2384	75.0000	2649.0000 (28a)
Wall Type 01	52.5000	18.2100	34.2900	0.1500	5.1435	70.0000	2400.3000 (29a)
Wall Type 06	12.7800	2.3900	10.3900	0.1200	1.2468	9.0000	93.5100 (29a)
Wall Type 5B	7.6900		7.6900	0.4100	3.1529	18.0000	138.4200 (29a)
Flat Roof	17.6400		17.6400	0.1000	1.7640	9.0000	158.7600 (30)
Slope Roof	19.7200		19.7200	0.1100	2.1692	9.0000	177.4800 (30)
Total net area of external elements Aum(A, m ²)			145.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.6117		(33)
Main dwelling							
Party Wall 1			85.2100	0.0000	0.0000	110.0000	9373.0999 (32)
Internal Wall 1			174.5400			9.0000	1570.8599 (32c)

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Internal Floor 1	34.4500	18.0000	620.1000 (32d)
Internal Floor 2	31.8400	18.0000	573.1200 (32d)
Internal Ceiling 1	35.3200	9.0000	317.8800 (32e)
Internal Ceiling 2	34.4500	9.0000	310.0500 (32e)

Heat capacity Cm = Sum(A x k)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
 List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	12.6700	0.0650	0.8236
E2 Other lintels (including other steel lintels)	7.0600	0.0140	0.0988
E3 Sill	26.8600	0.0120	0.3223
E4 Jamb	10.5800	0.0610	0.6454
E5 Ground floor (normal)	26.9300	0.0010	0.0269
E6 Intermediate floor within a dwelling	6.7390	0.0180	0.1213
E11 Eaves (insulation at rafter level)	2.6610	0.0510	0.1357
E12 Gable (insulation at ceiling level)	0.9440	0.0410	0.0387
E13 Gable (insulation at rafter level)	6.6000	0.0410	0.2706
E16 Corner (normal)	2.4000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	20.4000	0.0510	1.0404
E18 Party wall between dwellings	13.6600	0.0500	0.6830
P1 Party wall - Ground floor	14.2300	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling	3.4500	0.0400	0.1380
P4 Party wall - Roof (insulation at ceiling level)	3.3900	0.0750	0.2542
P5 Party wall - Roof (insulation at rafter level)	8.5800	0.0660	0.5663
R6 Flat ceiling	1.1100	0.1200	0.1332
R7 Flat ceiling (inverted)	1.5100	0.1200	0.1812
R8 Roof to wall (rafter)	2.4600	0.0380	0.0935
R9 Roof to wall (flat ceiling)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges
 Total fabric heat loss

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
 (38)m
 Heat transfer coeff
 Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9031	0.9031	0.9031	0.9031	0.9031	0.9031	0.9031	0.9031	0.9031	0.9031	0.9031	0.9031
HLP (average)												
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

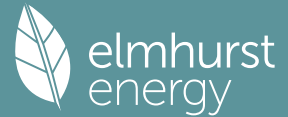
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7539 (42)
Hot water usage for mixer showers	70.3943	69.3364	67.7948	64.8454	62.6687	60.2413	58.8616	60.3915	62.0686	64.6748	67.6876	70.1246 (42a)
Hot water usage for baths	30.3951	29.9437	29.3080	28.1359	27.2583	26.2851	25.7594	26.3907	27.0780	28.1193	29.3155	30.2923 (42b)
Hot water usage for other uses	42.8331	41.2755	39.7179	38.1604	36.6028	35.0452	35.0452	36.6028	38.1604	39.7179	41.2755	42.8331 (42c)
Average daily hot water use (litres/day)												132.0214 (43)
Daily hot water use	143.6224	140.5556	136.8208	131.1416	126.5298	121.5717	119.6663	123.3850	127.3069	132.5121	138.2787	143.2500 (44)
Energy conte	227.4628	200.1493	210.2884	179.5264	170.3334	149.4866	144.7260	152.7764	156.9822	179.8176	197.0033	224.2948 (45)
Energy content (annual)										Total = Sum(45)m =		2192.8473
Distribution loss (46)m = 0.15 x (45)m	34.1194	30.0224	31.5433	26.9290	25.5500	22.4230	21.7089	22.9165	23.5473	26.9726	29.5505	33.6442 (46)
Water storage loss:												
Store volume												198.4000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6480 (55)
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (56)
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (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	270.8132	239.3045	253.6388	221.4784	213.6838	191.4386	188.0764	196.1268	198.9342	223.1680	238.9553	267.6452 (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	270.8132	239.3045	253.6388	221.4784	213.6838	191.4386	188.0764	196.1268	198.9342	223.1680	238.9553	267.6452 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2703.2633 (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	110.3117	97.8738	104.6012	93.2541	91.3162	83.2659	82.8017	85.4785	85.7582	94.4697	99.0652	109.2584 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.9364	144.9653	130.9364	135.3010	130.9364	135.3010	130.9364	130.9364	135.3010	130.9364	135.3010	130.9364 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	258.9046	261.5912	254.8210	240.4081	222.2143	205.1148	193.6912	191.0046	197.7748	212.1877	230.3815	247.4810 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697 (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)	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575 (71)
Water heating gains (Table 5)	148.2684	145.6455	140.5930	129.5196	122.7368	115.6471	111.2926	114.8904	119.1086	126.9754	137.5906	146.8526 (72)

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Total internal gains
602.4185 616.5111 590.6596 569.5377 540.1966 520.3719 500.2294 501.1405 516.4934 534.4086 567.5821 589.5792 (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				6.2000	19.6403	0.5400	0.8000			0.7700		36.4549 (76)
West				2.9000	19.6403	0.5400	0.8000			0.7700		17.0515 (80)
East				2.6500	19.6403	0.5400	0.8000			0.7700		15.5815 (76)
West				6.9400	19.6403	0.5400	0.8000			0.7700		40.8060 (80)

Solar gains	109.8939	214.9758	354.0345	516.3382	632.7919	647.7751	616.7083	529.7433	411.7568	255.0869	137.0248	90.3714 (83)
Total gains	712.3124	831.4869	944.6941	1085.8759	1172.9885	1168.1469	1116.9376	1030.8838	928.2502	789.4955	704.6069	679.9506 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.6471	55.6471	55.6471	55.6471	55.6471	55.6471	55.6471	55.6471	55.6471	55.6471	55.6471	55.6471
alpha	4.7098	4.7098	4.7098	4.7098	4.7098	4.7098	4.7098	4.7098	4.7098	4.7098	4.7098	4.7098
util living area	0.9853	0.9697	0.9327	0.8339	0.6746	0.4927	0.3596	0.4058	0.6418	0.8931	0.9717	0.9881 (86)
Living	20.0421	20.2134	20.4515	20.7143	20.8676	20.9217	20.9320	20.9303	20.8941	20.6665	20.2996	20.0000
Non living	19.0381	19.2538	19.5487	19.8590	20.0232	20.0724	20.0796	20.0787	20.0514	19.8126	19.3648	18.9848
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5100	20.2134	20.4515	20.7143	20.8676	20.9217	20.9320	20.9303	20.8941	20.6665	20.2996	20.1398 (87)
Th 2	20.1649	20.1649	20.1649	20.1649	20.1649	20.1649	20.1649	20.1649	20.1649	20.1649	20.1649	20.1649 (88)
util rest of house	0.9821	0.9633	0.9189	0.8039	0.6267	0.4321	0.2922	0.3338	0.5767	0.8655	0.9646	0.9854 (89)
MIT 2	19.7157	19.2538	19.5487	19.8590	20.0232	20.0724	20.0796	20.0787	20.0514	19.8126	19.3648	19.1974 (90)
Living area fraction	19.9061	19.4839	19.7652	20.0641	20.2256	20.2761	20.2839	20.2829	20.2534	20.0173	19.5889	0.2397 (91)
MIT	19.9061	19.4839	19.7652	20.0641	20.2256	20.2761	20.2839	20.2829	20.2534	20.0173	19.5889	19.4234 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9061	19.4839	19.7652	20.0641	20.2256	20.2761	20.2839	20.2829	20.2534	20.0173	19.5889	19.4234 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9809	0.9569	0.9113	0.8000	0.6304	0.4403	0.3019	0.3441	0.5839	0.8599	0.9584	0.9824 (94)
Useful gains	698.7105	795.6459	860.8767	868.7114	739.4046	514.3509	337.1964	354.7300	542.0461	678.9189	675.3259	668.0037 (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	1432.0431	1338.2401	1217.2341	1024.4360	782.3275	520.8448	338.0441	356.2988	564.6478	864.1520	1146.0073	1396.9224 (97)
Space heating kWh	545.5994	364.6233	265.1299	112.1217	31.9346	0.0000	0.0000	0.0000	0.0000	137.8134	338.8906	542.3155 (98a)
Space heating requirement - total per year (kWh/year)												2338.4285
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	545.5994	364.6233	265.1299	112.1217	31.9346	0.0000	0.0000	0.0000	0.0000	137.8134	338.8906	542.3155 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2338.4285
Space heating per m2										(98c) / (4) =		23.0138 (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 %)												244.6545 (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	545.5994	364.6233	265.1299	112.1217	31.9346	0.0000	0.0000	0.0000	0.0000	137.8134	338.8906	542.3155 (98)
Space heating efficiency (main heating system 1)	244.6545	244.6545	244.6545	244.6545	244.6545	0.0000	0.0000	0.0000	0.0000	244.6545	244.6545	244.6545 (210)
Space heating fuel (main heating system)	223.0081	149.0360	108.3691	45.8286	13.0530	0.0000	0.0000	0.0000	0.0000	56.3298	138.5180	221.6659 (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	270.8132	239.3045	253.6388	221.4784	213.6838	191.4386	188.0764	196.1268	198.9342	223.1680	238.9553	267.6452 (64)
Efficiency of water heater	189.9098	189.9098	189.9098	189.9098	189.9098	189.9098	189.9098	189.9098	189.9098	189.9098	189.9098	189.9098 (216)
Fuel for water heating, kWh/month	142.6010	126.0095	133.5575	116.6229	112.5186	100.8050	99.0346	103.2737	104.7519	117.5126	125.8257	140.9328 (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	3.9930	3.6066	3.9930	3.8642	3.9930	3.8642	3.9930	3.8642	3.9930	3.8642	3.9930	3.9930 (231)
Lighting	25.6917	20.6108	18.5578	13.5962	10.5021	8.5803	9.5804	12.4529	16.1751	21.2226	23.9709	26.4058 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-6.9643	-11.9646	-21.2323	-28.7890	-35.1556	-34.2804	-33.5999	-29.2514	-22.4639	-15.1751	-8.2500	-5.7437 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												

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(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												955.8085	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												189.9098	
Water heating fuel used												1423.4460	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 5.7980, total flow = 37.0000, SFP = 0.1567)													
mechanical ventilation fans (SFP = 0.1567)												47.0144	(230a)
Total electricity for the above, kWh/year												47.0144	(231)
Electricity for lighting (calculated in Appendix L)												207.3467	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-252.8702	(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												2380.7456	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	955.8085	0.1567	149.7617 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1423.4460	0.1410	200.7586 (264)
Space and water heating			350.5203 (265)
Pumps, fans and electric keep-hot	47.0144	0.1387	6.5215 (267)
Energy for lighting	207.3467	0.1443	29.9265 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-252.8702	0.1311	-33.1612
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-33.1612 (269)
Total CO2, kg/year			353.8071 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	955.8085	1.5800	1510.2069 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1423.4460	1.5215	2165.7883 (278)
Space and water heating			3675.9952 (279)
Pumps, fans and electric keep-hot	47.0144	1.5128	71.1234 (281)
Energy for lighting	207.3467	1.5338	318.0353 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-252.8702	1.4845	-375.3783
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-375.3783 (283)
Total Primary energy kWh/year			3689.7757 (286)
Dwelling Primary energy Rate (DPER)			36.3100 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	35.3200 (1b)	x 2.4000 (2b)	= 84.7680 (1b) - (3b)
First floor	34.4500 (1c)	x 2.7000 (2c)	= 93.0150 (1c) - (3c)
Second floor	31.8400 (1d)	x 2.1400 (2d)	= 68.1376 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	101.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	245.9206 (5)

2. Ventilation rate

m3 per hour

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Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1627 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4127	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3508	(21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)
Adj infilt rate	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)
Effective ac	0.4472	0.4384	0.4297	0.3858	0.3771	0.3332	0.3332	0.3244	0.3508	0.3771	0.3946	0.4121	(22b)
	0.6000	0.5961	0.5923	0.5744	0.5711	0.5555	0.5555	0.5526	0.5615	0.5711	0.5779	0.5849	(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							
TER Opaque door			1.9100	1.0000	1.9100		(26)
TER Opening Type			18.6900	1.1450	21.4008		(27)
Heatloss Floor 1			35.3200	0.1300	4.5916		(28a)
Wall Type 01	52.5000	18.2100	34.2900	0.1800	6.1722		(29a)
Wall Type 06	12.7800	2.3900	10.3900	0.1800	1.8702		(29a)
Wall Type 5B	7.6900		7.6900	0.1800	1.3842		(29a)
Flat Roof	17.6400		17.6400	0.1100	1.9404		(30)
Slope Roof	19.7200		19.7200	0.1100	2.1692		(30)
Total net area of external elements Aum(A, m2)			145.6500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.4386		(33)
Main dwelling							
Party Wall 1			85.2100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							180.9131 (35)

List of Thermal Bridges													
K1 Element													
E2 Other lintels (including other steel lintels)													
E3 Sill													
E4 Jamb													
E5 Ground floor (normal)													
E6 Intermediate floor within a dwelling													
E11 Eaves (insulation at rafter level)													
E12 Gable (insulation at ceiling level)													
E13 Gable (insulation at rafter level)													
E16 Corner (normal)													
E17 Corner (inverted - internal area greater than external area)													
E18 Party wall between dwellings													
P1 Party wall - Ground floor													
P2 Party wall - Intermediate floor within a dwelling													
P4 Party wall - Roof (insulation at ceiling level)													
P5 Party wall - Roof (insulation at rafter level)													
R6 Flat ceiling													
R7 Flat ceiling (inverted)													
R8 Roof to wall (rafter)													
R9 Roof to wall (flat ceiling)													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													
Point Thermal bridges													
Total fabric heat loss													

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	48.6923	48.3772	48.0683	46.6174	46.3460	45.0823	45.0823	44.8483	45.5691	46.3460	46.8951	47.4692	(38)
Average = Sum(39)m / 12 =	98.7861	98.4710	98.1621	96.7112	96.4398	95.1761	95.1761	94.9421	95.6629	96.4398	96.9889	97.5630	(39)
													96.7099
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9722	0.9691	0.9661	0.9518	0.9491	0.9367	0.9367	0.9344	0.9415	0.9491	0.9545	0.9602	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7539 (42)
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	143.6224	140.5556	136.8208	131.1416	126.5298	121.5717	119.6663	123.3850	127.3069	132.5121	138.2787	143.2500	(44)
Energy content (annual)	227.4628	200.1493	210.2884	179.5264	170.3334	149.4866	144.7260	152.7764	156.9822	179.8176	197.0033	224.2948	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	34.1194	30.0224	31.5433	26.9290	25.5500	22.4230	21.7089	22.9165	23.5473	26.9726	29.5505	33.6442	(46)
Store volume													198.4000 (47)

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a) If manufacturer declared loss factor is known (kWh/day):												1.6446 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8881 (55)
Total storage loss												
27.5311	24.8668	27.5311	26.6430	27.5311	26.6430	27.5311	27.5311	26.6430	27.5311	26.6430	27.5311	(56)
If cylinder contains dedicated solar storage												
27.5311	24.8668	27.5311	26.6430	27.5311	26.6430	27.5311	27.5311	26.6430	27.5311	26.6430	27.5311	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	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	(61)
Total heat required for water heating calculated for each month												
278.2564	246.0273	261.0820	228.6814	221.1270	198.6416	195.5196	203.5699	206.1372	230.6111	246.1584	275.0884	(62)
WWHRS	-32.1813	-28.4614	-29.8032	-24.6782	-22.9992	-19.6806	-18.4474	-19.6170	-20.3623	-24.0049	-27.1946	(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												
246.0750	217.5659	231.2788	204.0032	198.1278	178.9610	177.0722	183.9530	185.7749	206.6063	218.9637	243.5030	(64)
12Total per year (kWh/year)												
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												
116.2662	103.2521	110.5557	99.0165	97.2707	89.0283	88.7562	91.4330	91.5206	100.4242	104.8276	115.2129	(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	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969	137.6969	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
132.9298	147.1723	132.9298	137.3608	132.9298	137.3608	132.9298	132.9298	137.3608	132.9298	137.3608	132.9298	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
258.9046	261.5912	254.8210	240.4081	222.2143	205.1148	193.6912	191.0046	197.7748	212.1877	230.3815	247.4810	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	36.7697	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	-110.1575	(71)
Water heating gains (Table 5)												
156.2718	153.6489	148.5964	137.5230	130.7402	123.6504	119.2960	122.8938	127.1119	134.9787	145.5939	154.8560	(72)
Total internal gains	615.4152	629.7214	603.6563	582.6009	553.1934	530.4351	510.2261	511.1372	526.5566	547.4053	580.6453	602.5759 (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					8.8500	19.6403	0.6300	0.7000			0.7700	53.1205 (76)
West					9.8400	19.6403	0.6300	0.7000			0.7700	59.0628 (80)
Solar gains	112.1834	219.4544	361.4102	527.0953	645.9750	661.2704	629.5564	540.7796	420.3350	260.4012	139.8795	92.2541 (83)
Total gains	727.5986	849.1759	965.0665	1109.6962	1199.1684	1191.7054	1139.7825	1051.9169	946.8916	807.8065	720.5247	694.8300 (84)

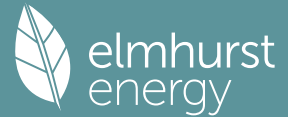
7. Mean internal temperature (heating season)

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	51.6902	51.8556	52.0188	52.7992	52.9478	53.6508	53.6508	53.7830	53.3778	52.9478	52.6480	52.3382
alpha	4.4460	4.4570	4.4679	4.5199	4.5299	4.5767	4.5767	4.5855	4.5585	4.5299	4.5099	4.4892
util living area	0.9851	0.9703	0.9356	0.8399	0.6846	0.4993	0.3650	0.4108	0.6500	0.8954	0.9715	0.9877 (86)
MIT	19.6862	19.9269	20.2660	20.6629	20.8925	20.9799	20.9961	20.9935	20.9367	20.6039	20.0833	19.6543 (87)
Th 2	20.1066	20.1092	20.1117	20.1237	20.1260	20.1364	20.1364	20.1384	20.1324	20.1260	20.1214	20.1167 (88)
util rest of house	0.9818	0.9638	0.9219	0.8097	0.6352	0.4362	0.2945	0.3359	0.5828	0.8676	0.9642	0.9849 (89)
MIT 2	18.5758	18.8809	19.3038	19.7842	20.0335	20.1235	20.1348	20.1354	20.0865	19.7301	19.0902	18.5425 (90)
Living area fraction												
MIT	18.8420	19.1317	19.5344	19.9948	20.2395	20.3288	20.3413	20.3411	20.2904	19.9396	19.3283	18.8091 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8420	19.1317	19.5344	19.9948	20.2395	20.3288	20.3413	20.3411	20.2904	19.9396	19.3283	18.8091 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9754	0.9548	0.9113	0.8048	0.6419	0.4505	0.3114	0.3537	0.5956	0.8607	0.9557	0.9792 (94)
Useful gains	709.7119	810.8028	879.4903	893.0875	769.7915	536.8832	354.8884	372.0667	564.0028	695.2955	688.5971	680.3987 (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	1436.5490	1401.4064	1279.4870	1072.9958	823.5449	545.2470	356.0825	374.1806	592.1879	900.7060	1186.0087	1425.3051 (97)
Space heating kWh	540.7668	396.8857	297.5976	129.5339	39.9926	0.0000	0.0000	0.0000	0.0000	152.8254	358.1363	554.2103 (98a)
Space heating requirement - total per year (kWh/year)												2469.9485
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	540.7668	396.8857	297.5976	129.5339	39.9926	0.0000	0.0000	0.0000	0.0000	152.8254	358.1363	554.2103 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2469.9485
Space heating per m2												(98c) / (4) = 24.3081 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	540.7668	396.8857	297.5976	129.5339	39.9926	0.0000	0.0000	0.0000	0.0000	152.8254	358.1363	554.2103	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	585.8795	429.9953	322.4242	140.3401	43.3289	0.0000	0.0000	0.0000	0.0000	165.5746	388.0134	600.4446	(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	246.0750	217.5659	231.2788	204.0032	198.1278	178.9610	177.0722	183.9530	185.7749	206.6063	218.9637	243.5030	(64)
Efficiency of water heater (217)m	85.7746	85.3900	84.6263	83.0697	81.1819	79.8000	79.8000	79.8000	79.8000	83.3937	85.1560	79.8000	(216)
Fuel for water heating, kWh/month	286.8856	254.7907	273.2944	245.5807	244.0542	224.2620	221.8950	230.5175	232.8006	247.7480	257.1324	283.6554	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	27.6202	22.1579	19.9508	14.6168	11.2904	9.2244	10.2995	13.3877	17.3893	22.8157	25.7703	28.3878	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-34.9448	-50.2825	-73.7414	-84.6290	-92.6961	-87.0036	-85.8953	-80.3630	-70.8670	-58.2320	-38.7635	-30.0911	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-16.7706	-35.5820	-71.2963	-107.9367	-143.5716	-144.6014	-142.9391	-120.6707	-87.9524	-51.2133	-22.4940	-13.2423	(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												2676.0006	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												3002.6164	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												222.9107	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1745.7795	(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												4241.7482	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2676.0006	0.2100	561.9601	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3002.6164	0.2100	630.5495	(264)
Space and water heating			1192.5096	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	222.9107	0.1443	32.1729	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-787.5093	0.1342	-105.6604	
PV Unit electricity exported	-958.2702	0.1257	-120.4124	
Total			-226.0728	(269)
Total CO2, kg/year			1010.5389	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2676.0006	1.1300	3023.8806	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3002.6164	1.1300	3392.9566	(278)
Space and water heating			6416.8372	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	222.9107	1.5338	341.9079	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-787.5093	1.4958	-1177.9939	
PV Unit electricity exported	-958.2702	0.4612	-441.9851	
Total			-1619.9790	(283)
Total Primary energy kWh/year			5268.8669	(286)

Target Primary Energy Rate (TPER)

51.8500 (287)