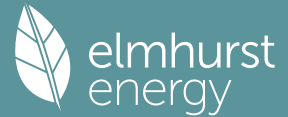


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Property Reference	Plot 5			Issued on Date	11/09/2025
Assessment Reference	As-Built	Prop Type Ref			
Property	10 Forge Close, Caversham, READING, RG4 8BG				
SAP Rating	84 B	DER	4.29	TER	12.86
Environmental	97 A	% DER < TER			66.64
CO ₂ Emissions (t/year)	0.27	DFEE	38.56	TFEE	40.47
Compliance Check	See BREL	% DFEE < TFEE			4.73
% DPER < TPER	33.89	DPER	44.50	TPER	67.32
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	34.3500 (1b)	x 2.4000 (2b)	= 82.4400 (1b) - (3b)
First floor	35.0200 (1c)	x 2.7000 (2c)	= 94.5540 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	176.9940 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0400 (17)
Infiltration rate	0.2020 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1869 (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	0.2382	0.2336	0.2289	0.2055	0.2009	0.1775	0.1775	0.1728	0.1869	0.2009	0.2102	0.2195 (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			6.7100	1.1450	7.6832		(27)
Bifold Door			9.5900	1.5038	14.4211		(27)
Front Door			1.9100	1.6000	3.0560		(26)
Heatloss Floor 1			35.0200	0.1200	4.2024	75.0000	2626.5000 (28a)
Wall Type 01	87.4200	18.2100	69.2100	0.1500	10.3815	110.0000	7613.0998 (29a)
Flat Roof	34.3500		34.3500	0.1100	3.7785	9.0000	309.1500 (30)
Total net area of external elements Aum(A, m ²)			156.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.5227		(33)
Main dwelling							
Party Wall 1			36.2000	0.0000	0.0000	110.0000	3982.0001 (32)
Internal Wall 1			137.8300			9.0000	1240.4700 (32c)
Internal Floor 1			34.3500			18.0000	618.3000 (32d)
Internal Ceiling 1			34.3500			9.0000	309.1500 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	16698.6699 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												240.7189 (35)
List of Thermal Bridges												
						Length	Psi-value	Total				
K1 Element						10.4000	0.0650	0.6760				
E2 Other lintels (including other steel lintels)						4.9700	0.0140	0.0696				
E3 Sill						22.6600	0.0120	0.2719				
E4 Jamb						17.4300	0.0610	1.0632				
E5 Ground floor (normal)						16.8800	0.0010	0.0169				
E6 Intermediate floor within a dwelling						16.8800	0.0570	0.9622				
E10 Eaves (insulation at ceiling level)						12.6000	0.0410	0.5166				
E16 Corner (normal)						2.4000	0.0000	0.0000				
E17 Corner (inverted - internal area greater than external area)						10.2000	0.0510	0.5202				
P1 Party wall - Ground floor						13.6600	0.0500	0.6830				
P2 Party wall - Intermediate floor within a dwelling						6.8300	0.0000	0.0000				
P4 Party wall - Roof (insulation at ceiling level)						6.8300	0.0400	0.2732				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												5.0528 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 48.5754 (37)

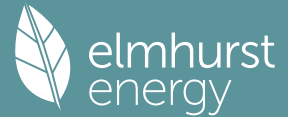
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	29.2040	29.2040	29.2040	29.2040	29.2040	29.2040	29.2040	29.2040	29.2040	29.2040	29.2040	29.2040 (38)
Average = Sum(39)m / 12 =	77.7794	77.7794	77.7794	77.7794	77.7794	77.7794	77.7794	77.7794	77.7794	77.7794	77.7794	77.7794 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1212	1.1212	1.1212	1.1212	1.1212	1.1212	1.1212	1.1212	1.1212	1.1212	1.1212	1.1212 (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												2.2307 (42)
Hot water usage for mixer showers												
Hot water usage for baths	61.6217	60.6956	59.3462	56.7643	54.8589	52.7340	51.5262	52.8655	54.3335	56.6150	59.2524	61.3856 (42a)
Hot water usage for other uses	26.6226	26.2272	25.6704	24.6438	23.8751	23.0227	22.5623	23.1152	23.7172	24.6293	25.6770	26.5326 (42b)
Average daily hot water use (litres/day)	37.4749	36.1122	34.7495	33.3868	32.0240	30.6613	30.6613	32.0240	33.3868	34.7495	36.1122	37.4749 (42c)
Daily hot water use												115.5646 (43)
Energy conte	125.7192	123.0350	119.7661	114.7949	110.7580	106.4181	104.7499	108.0047	111.4375	115.9937	121.0416	125.3931 (44)
Energy content (annual)	199.1085	175.2003	184.0760	157.1484	149.1016	130.8534	126.6859	133.7324	137.4135	157.4024	172.4459	196.3353 (45)
Distribution loss (46)m = 0.15 x (45)m	29.8663	26.2800	27.6114	23.5723	22.3652	19.6280	19.0029	20.0599	20.6120	23.6104	25.8669	29.4503 (46)
Water storage loss:												198.4000 (47)
Store volume												1.2000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6480 (55)
Enter (49) or (54) in (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	242.4589	214.3555	227.4264	199.1004	192.4520	172.8054	170.0363	177.0828	179.3655	200.7528	214.3979	239.6857 (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	242.4589	214.3555	227.4264	199.1004	192.4520	172.8054	170.0363	177.0828	179.3655	200.7528	214.3979	239.6857 (64)
Total per year (kWh/year)												2429.9197 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	100.8839	89.5782	95.8856	85.8134	84.2566	77.0704	76.8034	79.1463	79.2516	87.0166	90.8999	99.9618 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	98.7698	109.3523	98.7698	102.0622	98.7698	102.0622	98.7698	98.7698	102.0622	98.7698	102.0622	98.7698 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	195.8222	197.8543	192.7336	181.8324	168.0716	155.1383	146.4982	144.4661	149.5868	160.4880	174.2488	187.1820 (68)
Pumps, fans	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293 (71)
Total internal gains	135.5966	133.3010	128.8785	119.1853	113.2481	107.0422	103.2303	106.3795	110.0717	116.9578	126.2498	134.3573 (72)
	486.6497	496.9685	476.8429	459.5409	436.5505	420.7037	404.9593	406.0764	418.1816	432.6766	459.0218	476.7701 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							

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East				4.9200		19.6403		0.5400		0.8000		0.7700		28.9287 (76)
West				1.7900		19.6403		0.5400		0.8000		0.7700		10.5249 (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	95.8411	187.4856	308.7620	450.3110	551.8731	564.9403	537.8462	462.0019	359.1030	222.4674	119.5026	78.8151	(83)
Total gains	582.4908	684.4541	785.6050	909.8519	988.4236	985.6439	942.8055	868.0784	777.2846	655.1440	578.5244	555.5852	(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	59.6368	59.6368	59.6368	59.6368	59.6368	59.6368	59.6368	59.6368	59.6368	59.6368	59.6368	59.6368	
alpha	4.9758	4.9758	4.9758	4.9758	4.9758	4.9758	4.9758	4.9758	4.9758	4.9758	4.9758	4.9758	
util living area	0.9897	0.9769	0.9433	0.8464	0.6827	0.4965	0.3615	0.4092	0.6525	0.9070	0.9788	0.9918	(86)
Living	20.0705	20.2372	20.4734	20.7324	20.8795	20.9277	20.9361	20.9347	20.9023	20.6801	20.3196	20.0306	
Non living	18.9098	19.1195	19.4106	19.7102	19.8591	19.8984	19.9031	19.9026	19.8820	19.6616	19.2258	18.8592	
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	20.5245	20.2372	20.4734	20.7324	20.8795	20.9277	20.9361	20.9347	20.9023	20.6801	20.3196	20.1662	(87)
Th 2	19.9835	19.9835	19.9835	19.9835	19.9835	19.9835	19.9835	19.9835	19.9835	19.9835	19.9835	19.9835	(88)
util rest of house	0.9866	0.9703	0.9275	0.8094	0.6226	0.4214	0.2788	0.3203	0.5706	0.8742	0.9715	0.9893	(89)
MIT 2	19.5555	19.1195	19.4106	19.7102	19.8591	19.8984	19.9031	19.9026	19.8820	19.6616	19.2258	19.0618	(90)
Living area fraction									fLA = Living area / (4) =			0.3512	(91)
MIT	19.8958	19.5119	19.7838	20.0691	20.2174	20.2598	20.2659	20.2650	20.2403	20.0193	19.6099	19.4496	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8958	19.5119	19.7838	20.0691	20.2174	20.2598	20.2659	20.2650	20.2403	20.0193	19.6099	19.4496	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9863	0.9665	0.9239	0.8128	0.6370	0.4421	0.3019	0.3451	0.5922	0.8755	0.9681	0.9877	(94)
Useful gains	574.5222	661.5110	725.8071	739.5557	629.6395	435.7685	284.6105	299.6149	460.3304	573.6082	560.0488	548.7283	(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	1213.0299	1136.5091	1033.2071	868.7295	662.4809	440.2192	285.1289	300.6210	477.5869	732.6250	973.0120	1186.1087	(97)
Space heating kWh	475.0498	319.1988	228.7056	93.0051	24.4340	0.0000	0.0000	0.0000	0.0000	118.3086	297.3335	474.2110	(98a)
Space heating requirement - total per year (kWh/year)												2030.2464	
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	475.0498	319.1988	228.7056	93.0051	24.4340	0.0000	0.0000	0.0000	0.0000	118.3086	297.3335	474.2110	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2030.2464	
Space heating per m2										(98c) / (4) =		29.2669	(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 %)													242.5749 (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	475.0498	319.1988	228.7056	93.0051	24.4340	0.0000	0.0000	0.0000	0.0000	118.3086	297.3335	474.2110	(98)
Space heating efficiency (main heating system 1)	242.5749	242.5749	242.5749	242.5749	242.5749	0.0000	0.0000	0.0000	0.0000	242.5749	242.5749	242.5749	(210)
Space heating fuel (main heating system)	195.8363	131.5877	94.2825	38.3408	10.0728	0.0000	0.0000	0.0000	0.0000	48.7720	122.5739	195.4906	(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	242.4589	214.3555	227.4264	199.1004	192.4520	172.8054	170.0363	177.0828	179.3655	200.7528	214.3979	239.6857	(64)
Efficiency of water heater	190.7149	190.7149	190.7149	190.7149	190.7149	190.7149	190.7149	190.7149	190.7149	190.7149	190.7149	190.7149	(216)
Fuel for water heating, kWh/month	127.1316	112.3957	119.2494	104.3969	100.9108	90.6093	89.1573	92.8521	94.0490	105.2633	112.4180	125.6775	(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	2.9432	2.6583	2.9432	2.8482	2.9432	2.8482	2.9432	2.9432	2.8482	2.9432	2.8482	2.9432	(231)
Lighting	19.3723	15.5412	13.9931	10.2520	7.9189	6.4698	7.2239	9.3899	12.1965	16.0025	18.0748	19.9107	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-8.0504	-12.8216	-23.2012	-35.2326	-47.2308	-47.8620	-45.9762	-37.0352	-25.2578	-16.0465	-9.2375	-6.8737	(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)

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Annual totals kWh/year	
Space heating fuel - main system 1	836.9565 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	190.7149
Water heating fuel used	1274.1109 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(MEVDecentralised, Database: total watage = 4.6540, total flow = 29.0000, SFP = 0.1605)	
mechanical ventilation fans (SFP = 0.1605)	34.6535 (230a)
Total electricity for the above, kWh/year	34.6535 (231)
Electricity for lighting (calculated in Appendix L)	156.3457 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-314.8256 (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	1987.2410 (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	836.9565	0.1568	131.2195 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1274.1109	0.1410	179.6193 (264)
Space and water heating			310.8388 (265)
Pumps, fans and electric keep-hot	34.6535	0.1387	4.8069 (267)
Energy for lighting	156.3457	0.1443	22.5655 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-314.8256	0.1301	-40.9600
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-40.9600 (269)
Total CO2, kg/year			297.2512 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2900 (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	836.9565	1.5804	1322.7135 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1274.1109	1.5213	1938.2827 (278)
Space and water heating			3260.9962 (279)
Pumps, fans and electric keep-hot	34.6535	1.5128	52.4238 (281)
Energy for lighting	156.3457	1.5338	239.8083 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-314.8256	1.4806	-466.1155
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-466.1155 (283)
Total Primary energy kWh/year			3087.1127 (286)
Dwelling Primary energy Rate (DPER)			44.5000 (287)

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

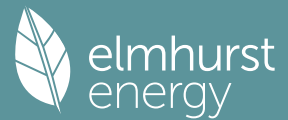
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	34.3500 (1b)	x 2.4000 (2b)	= 82.4400 (1b) - (3b)
First floor	35.0200 (1c)	x 2.7000 (2c)	= 94.5540 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.3700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	176.9940 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1130 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50												5.0000 (17)
Infiltration rate												0.3630 (18)
Number of sides sheltered												1 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.3358 (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	0.4281	0.4197	0.4113	0.3694	0.3610	0.3190	0.3190	0.3106	0.3358	0.3610	0.3777	0.3945 (22b)
	0.5916	0.5881	0.5846	0.5682	0.5651	0.5509	0.5509	0.5482	0.5564	0.5651	0.5713	0.5778 (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			15.4300	1.1450	17.6679		(27)
Heatloss Floor 1			35.0200	0.1300	4.5526		(28a)
Wall Type 01		17.3400	70.0800	0.1800	12.6144		(29a)
Flat Roof	87.4200		34.3500	0.1100	3.7785		(30)
Total net area of external elements Aum(A, m2)			156.7900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 40.5234		(33)
Main dwelling							
Party Wall 1			36.2000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 240.7189 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.4000	0.0500	0.5200
E3 Sill	4.9700	0.0500	0.2485
E4 Jamb	22.6600	0.0500	1.1330
E5 Ground floor (normal)	17.4300	0.1600	2.7888
E6 Intermediate floor within a dwelling	16.8800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	16.8800	0.0600	1.0128
E16 Corner (normal)	12.6000	0.0900	1.1340
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0900	-0.2160
E18 Party wall between dwellings	10.2000	0.0600	0.6120
P1 Party wall - Ground floor	13.6600	0.0800	1.0928
P2 Party wall - Intermediate floor within a dwelling	6.8300	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	6.8300	0.1200	0.8196

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1455 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 49.6689 (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	34.5565	34.3486	34.1449	33.1880	33.0090	32.1756	32.1756	32.0212	32.4966	33.0090	33.3712	33.7498 (38)
Average = Sum(39)m / 12 =	84.2254	84.0176	83.8139	82.8570	82.6779	81.8445	81.8445	81.6902	82.1655	82.6779	83.0401	83.4188 (39)
												82.8561

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2141	1.2112	1.2082	1.1944	1.1918	1.1798	1.1798	1.1776	1.1845	1.1918	1.1971	1.2025 (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												2.2307 (42)
Hot water usage for mixer showers												
61.6217	60.6956	59.3462	56.7643	54.8589	52.7340	51.5262	52.8655	54.3335	56.6150	59.2524	61.3856	(42a)
Hot water usage for baths												
26.6226	26.2272	25.6704	24.6438	23.8751	23.0227	22.5623	23.1152	23.7172	24.6293	25.6770	26.5326	(42b)
Hot water usage for other uses												
37.4749	36.1122	34.7495	33.3868	32.0240	30.6613	30.6613	32.0240	33.3868	34.7495	36.1122	37.4749	(42c)
Average daily hot water use (litres/day)												115.5646 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
125.7192	123.0350	119.7661	114.7949	110.7580	106.4181	104.7499	108.0047	111.4375	115.9937	121.0416	125.3931	125.3931 (44)
Energy conte	199.1085	175.2003	184.0760	157.1484	149.1016	130.8534	126.6859	133.7324	137.4135	157.4024	172.4459	196.3353 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
29.8663	26.2800	27.6114	23.5723	22.3652	19.6280	19.0029	20.0599	20.6120	23.6104	25.8669	29.4503	29.4503 (46)

Water storage loss: 198.4000 (47)

Store volume 1.6446 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.8881 (55)

Enter (49) or (54) in (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 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 27.5311 (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 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 0.0000 (61)

Total heat required for water heating calculated for each month 249.9020 221.0783 234.8696 206.3034 199.8951 180.0084 177.4794 184.5259 186.5686 208.1959 221.6010 247.1288 (62)

WWHRS -28.1709 -24.9145 -26.0891 -21.6028 -20.1330 -17.2280 -16.1485 -17.1723 -17.8247 -21.0134 -23.8056 -27.6492 (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 221.7312 196.1638 208.7805 184.7007 179.7621 162.7805 161.3309 167.3536 168.7439 187.1826 197.7953 219.4797 (64)

Total per year (kWh/year) = Sum(64a)m = 2255.8046 (64a)

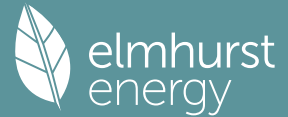
12Total per year (kWh/year) 2256 (64)

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 106.8384 94.9565 101.8401 91.5759 90.2111 82.8328 82.7579 85.1008 85.0140 92.9711 96.6623 105.9163 (65)

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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	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366	111.5366 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	98.7747	109.3577	98.7747	102.0672	98.7747	102.0672	98.7747	98.7747	102.0672	98.7747	102.0672	98.7747 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	195.8222	197.8543	192.7336	181.8324	168.0716	155.1383	146.4982	144.4661	149.5868	160.4880	174.2488	187.1820 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537	34.1537 (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)	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293	-89.2293 (71)
Water heating gains (Table 5)	143.6000	141.3043	136.8819	127.1887	121.2515	115.0455	111.2337	114.3829	118.0750	124.9612	134.2532	142.3606 (72)
Total internal gains	497.6579	507.9773	487.8512	470.5493	447.5587	428.7120	412.9675	414.0847	426.1900	443.6848	470.0301	487.7783 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
East	7.1700		19.6403		0.6300		0.7000		0.7700		43.0366 (76)	
West	8.2600		19.6403		0.6300		0.7000		0.7700		49.5792 (80)	
Solar gains	92.6158	181.1761	298.3713	435.1568	533.3009	545.9284	519.7461	446.4542	347.0182	214.9808	115.4810	76.1627 (83)
Total gains	590.2737	689.1534	786.2225	905.7060	980.8597	974.6405	932.7136	860.5389	773.2081	658.6656	585.5112	563.9411 (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	55.0727	55.2089	55.3431	55.9823	56.1035	56.6748	56.6748	56.7819	56.4534	56.1035	55.8588	55.6052
alpha	4.6715	4.6806	4.6895	4.7322	4.7402	4.7783	4.7783	4.7855	4.7636	4.7402	4.7239	4.7070
util living area	0.9899	0.9787	0.9500	0.8647	0.7129	0.5243	0.3836	0.4320	0.6797	0.9156	0.9796	0.9917 (86)
MIT	19.7065	19.9325	20.2624	20.6536	20.8901	20.9797	20.9963	20.9936	20.9345	20.5944	20.0836	19.6723 (87)
Th 2	19.9087	19.9111	19.9134	19.9245	19.9265	19.9362	19.9362	19.9380	19.9325	19.9265	19.9224	19.9180 (88)
util rest of house	0.9868	0.9723	0.9353	0.8290	0.6507	0.4427	0.2922	0.3346	0.5940	0.8840	0.9724	0.9892 (89)
MIT 2	18.4308	18.7172	19.1277	19.5951	19.8416	19.9255	19.9351	19.9359	19.8920	19.5437	18.9192	18.3940 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.8787	19.1440	19.5261	19.9668	20.2098	20.2957	20.3077	20.3073	20.2581	19.9127	19.3281	18.8429 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.8787	19.1440	19.5261	19.9668	20.2098	20.2957	20.3077	20.3073	20.2581	19.9127	19.3281	18.8429 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9828	0.9665	0.9290	0.8306	0.6680	0.4708	0.3243	0.3689	0.6215	0.8835	0.9672	0.9857 (94)
Useful gains	580.1048	666.0714	730.4159	752.2822	655.2180	458.8902	302.4978	317.4372	480.5789	581.9206	566.2927	555.8569 (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	1227.9014	1196.7430	1091.7708	916.9595	703.5722	466.1612	303.4565	319.1868	505.9825	769.9523	1015.4206	1221.4950 (97)
Space heating kWh	481.9606	356.6113	268.8480	118.5676	35.9756	0.0000	0.0000	0.0000	0.0000	139.8956	323.3721	495.2347 (98a)
Space heating requirement - total per year (kWh/year)												2220.4655
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	481.9606	356.6113	268.8480	118.5676	35.9756	0.0000	0.0000	0.0000	0.0000	139.8956	323.3721	495.2347 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2220.4655
Space heating per m ²												(98c) / (4) = 32.0090 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	481.9606	356.6113	268.8480	118.5676	35.9756	0.0000	0.0000	0.0000	0.0000	139.8956	323.3721	495.2347 (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)	522.1675	386.3611	291.2763	128.4590	38.9768	0.0000	0.0000	0.0000	0.0000	151.5662	350.3490	536.5490 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating

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Water heating requirement	221.7312	196.1638	208.7805	184.7007	179.7621	162.7805	161.3309	167.3536	168.7439	187.1826	197.7953	219.4797	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7526	85.3827	84.6279	83.0925	81.1719	79.8000	79.8000	79.8000	79.8000	83.4160	85.1551	85.8275	(217)
Fuel for water heating, kWh/month	258.5708	229.7464	246.7040	222.2831	221.4586	203.9856	202.1691	209.7163	211.4585	224.3964	232.2766	255.7219	(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	20.5234	16.4647	14.8246	10.8611	8.3895	6.8543	7.6531	9.9478	12.9213	16.9534	19.1488	21.0938	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-32.3372	-45.6957	-65.8482	-74.2472	-80.2599	-75.0038	-74.0862	-69.8430	-62.3848	-52.3500	-35.5916	-27.9457	(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	-17.9580	-37.8107	-75.2063	-113.0300	-149.5191	-150.2405	-148.4636	-125.6696	-92.0728	-54.0895	-23.9835	-14.1977	(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												2405.7048	(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												2718.4874	(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)												165.6358	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1697.8347	(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												3677.9933	(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	2405.7048	0.2100	505.1980	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2718.4874	0.2100	570.8824	(264)
Space and water heating			1076.0804	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	165.6358	0.1443	23.9064	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-695.5933	0.1345	-93.5752	
PV Unit electricity exported	-1002.2414	0.1259	-126.1604	
Total			-219.7356	(269)
Total CO2, kg/year			892.1804	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.8600	(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	2405.7048	1.1300	2718.4464	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2718.4874	1.1300	3071.8908	(278)
Space and water heating			5790.3372	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	165.6358	1.5338	254.0577	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-695.5933	1.4972	-1041.4289	
PV Unit electricity exported	-1002.2414	0.4621	-463.0948	
Total			-1504.5238	(283)
Total Primary energy kWh/year			4669.9719	(286)
Target Primary Energy Rate (TPER)			67.3200	(287)