

# SAP 10 WORKSHEET (Version 10.2, December 2021) CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

Date 25/10/2023



Complete Energy Consultancy Ltd

The Exchange  
Brickrow  
Stroud  
Tel: 07771 964593

Property	
UPRN	UPRN-000000000
Address	Little Tresevern; Tresevern;

1 Overall dwelling dimensions				
Ground floor	140.0000	2.3500	329.0000	(1b) – (3b)
First floor	146.0000	2.6500	386.9000	(1c) – (3c)
Total floor area			286.0000	(4)
Dwelling volume (m <sup>3</sup> )			715.9000	(5)

2 Ventilation rate														
Number of chimneys														0 (6a)
Number of open flues														0 (6b)
Number of chimneys/flues to closed fires														0 (6c)
Number of flues to solid fuel boilers														0 (6d)
Number of flues attached to other heaters														0 (6d)
Number of blocked chimneys														0 (6f)
Number of intermittent fans														70 (7a)
Number of passive vents														0 (7b)
Number of flueless gas fires														0 (7c)
Infiltration due to chimneys, flues and fans														0.0978 (8)
Predicted Design q50(assumed)														3.0000 (17)
Infiltration rate														0.2478 (18)
Number of sides sheltered														2 (19)
Shelter factor														0.8500 (20)
Infiltration rate incorporating shelter factor														0.2106 (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		0.2685	0.2633	0.2580	0.2317	0.2264	0.2001	0.2001	0.1948	0.2106	0.2264	0.2369	0.2475	(22b)
Effective ach		0.5361	0.5347	0.5333	0.5268	0.5256	0.5200	0.5200	0.5190	0.5222	0.5256	0.5281	0.5306	(25)

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3. Heat losses and heat loss parameter												
Windows (1)									54.8500	0.9615	52.7404	(27)
groundFloor								140.0000	0.1000	14.0000	75.0000	10500.0000 (28a)
exposeWall								92.0300	0.1800	34.5654	9.0000	1728.2700 (29a)
exposeWall								.1200	0.1800	1.1016	9.0000	55.0800 (29a)
exposeWall								9.0000	0.1800	3.4200	9.0000	171.0000 (29a)
exposedRoof								105.0000	0.1000	10.5000	9.0000	945.0000 (30)
exposedRoof								77.0000	0.1500	11.5500	9.0000	693.0000 (30)
exposedRoof								5.0000	0.1000	0.5000	9.0000	45.0000 (30)
Total area of external elements:												599.0000 (31)
Fabric heat loss:												128.3774 (33)
Heat capacity:												14137.3500 (34)
Thermal mass parameter:												100.0000 (35)
Thermal bridges:												18.1160 (36)
Total fabric heat loss :												146.4934 (37)
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Vent loss	126.6412	126.3105	125.9863	124.4635	124.1786	122.8523	122.8523	122.6067	123.3632	124.1786	124.7549	125.3575 (38)
Heat transfer coeff	273.1346	272.8039	272.4797	270.9569	270.6720	269.3457	269.3457	269.1001	269.8565	270.6720	271.2483	271.8509 (39)
Heat transfer coeff (average)												270.9555 (39)
HLP	0.9550	0.9539	0.9527	0.9474	0.9464	0.9418	0.9418	0.9409	0.9436	0.9464	0.9484	0.9505 (40)
HLP (average)												0.9474 (40)
Days in month	31.0000	28.0000	31.0000	30.0000	31.0000	30.0000	31.0000	31.0000	30.0000	31.0000	30.0000	31.0000 (41)
heat pump calculation Output power												9040.0000
Design heat loss												6557.1234
Plant size ratio												1.3787
Service provision							space	and	water	heating	all	year
DHW vessel											separate	specified
Heating duration												variable
Secondary fraction												0.0000
Space heating thermal efficiency												377.1357
Summer thermal efficiency												175.5843

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Net space heating specific electricity generated	0.0000
Net water heating specific electricity generated	0.0000
Net annual electricity generated	0.0000
Heat losses and heat loss parameter	complete

4. Water heating energy requirements													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy													3.1137 (42)
Average daily hot water use (litres/day)													143.3381 (43)
Mixer shower usage	76.4269	75.2784	73.6047	70.4025	68.0393	65.4039	63.9059	65.5669	67.3877	70.2173	73.4883	76.1341	(42a)
Bath usage	32.9893	32.4994	31.8094	30.5373	29.5848	28.5285	27.9580	28.6431	29.3891	30.5193	31.8176	32.8778	(42b)
Other usage	46.5177	44.8262	43.1346	41.4430	39.7515	38.0599	38.0599	39.7515	41.4430	43.1346	44.8262	46.5177	(42c)
Daily hot water use	155.9339	152.6039	148.5487	142.3828	137.3755	131.9924	129.9239	133.9615	138.2198	143.8712	150.1321	155.5296	(44)
Energy content	246.9612	217.3059	228.3139	194.9150	184.9339	162.3000	157.1317	165.8724	170.4389	195.2318	213.8907	243.5217	(45)
Energy content(annual)													2380.8169 (45)
Distribution loss	37.0442	32.5959	34.2471	29.2372	27.7401	24.3450	23.5698	24.8809	25.5658	29.2848	32.0836	36.5283	(46)
Cylinder volume													110.0000 (47)
Measured cylinder loss (kWh/day)													2.0900 (48)
Temperature factor													0.5400 (49)
Energy lost from water storage (kWh/day)													1.1286 (50)
Energy lost from cylinder in kWh/day													1.1286 (55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
Net storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(57)
Primary loss	43.3132	39.1216	43.3132	41.9160	43.3132	41.9160	43.3132	43.3132	41.9160	43.3132	41.9160	43.3132	(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	325.2610	288.0283	306.6137	270.6890	263.2337	238.0740	235.4315	244.1722	246.2129	273.5316	289.6647	321.8215	(62)
WWHRS Saving	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 Saving	-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 Saving	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)
WW heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Flue gas heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(G6)

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Fghrs PV	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
Output from w/h	325.2610	288.0283	306.6137	270.6890	263.2337	238.0740	235.4315	244.1722	246.2129	273.5316	289.6647	321.8215	(64)
Output from water heater(annual)												3302.7339	(64)
Instantaneous electric showers	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)
Heat gains (kWh)	144.7544	128.8321	138.5542	125.4284	124.1304	114.5840	114.8861	117.7924	117.2901	127.5544	131.7378	143.6108	(65)

5. Internal gains													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	(66)
Lighting	232.9931	257.9567	232.9931	240.7595	232.9931	240.7595	232.9931	232.9931	240.7595	232.9931	240.7595	232.9931	(67)
Appliances	446.8266	451.4633	439.7791	414.9047	383.5053	353.9943	334.2791	329.6424	341.3267	366.2010	397.6004	427.1115	(68)
Cooking	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	(69)
Pumps, fans	10.0000	10.0000	10.0000	10.0000	10.0000	0.0000	0.0000	0.0000	0.0000	10.0000	10.0000	10.0000	(70)
Losses	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	(71)
Water heating	194.5624	191.7145	186.2288	174.2061	166.8419	159.1444	154.4168	158.3231	162.9029	171.4441	182.9692	193.0253	(72)
Total internal	954.0881	980.8404	938.7069	909.5763	863.0462	823.6041	791.3950	790.6646	814.6951	850.3442	901.0352	932.8358	(73)

6. Solar gains													
Windows (1)										54.8500	0.9615	52.7404	(27)
groundFloor							140.0000	0.1000	14.0000	75.0000	10500.0000		(28a)
exposeWall							92.0300	0.1800	34.5654	9.0000	1728.2700		(29a)
exposeWall							.1200	0.1800	1.1016	9.0000	55.0800		(29a)
exposeWall							9.0000	0.1800	3.4200	9.0000	171.0000		(29a)
exposedRoof							105.0000	0.1000	10.5000	9.0000	945.0000		(30)
exposedRoof							77.0000	0.1500	11.5500	9.0000	693.0000		(30)
exposedRoof							5.0000	0.1000	0.5000	9.0000	45.0000		(30)
Total area of external elements:												599.0000	(31)
Fabric heat loss:												128.3774	(33)
Heat capacity:												14137.3500	(34)
Thermal mass parameter:												100.0000	(35)
Thermal bridges:												18.1160	(36)
Total fabric heat loss :												146.4934	(37)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	291.3208	535.4087	836.6429	1211.0838	1515.7381	1574.8140	1489.1426	1251.1494	964.6234	619.8015	356.0705	244.6928	(83)
<b>Total gains</b>	<b>1245.4090</b>	<b>1516.2491</b>	<b>1775.3498</b>	<b>2120.6602</b>	<b>2378.7843</b>	<b>2398.4181</b>	<b>2280.5375</b>	<b>2041.8140</b>	<b>1779.3185</b>	<b>1470.1457</b>	<b>1257.1057</b>	<b>1177.5286</b>	<b>(84)</b>

**7. Mean internal temperature**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Living room temperature during heating periods Th1													21.0000 (85)	
Heating system responsiveness													0.7500	
tau			29.0862	29.1215	29.1561	29.3200	29.3508	29.4953	29.4953	29.5223	29.4395	29.3508	29.2885	29.2235
alpha			2.9391	2.9414	2.9437	2.9547	2.9567	2.9664	2.9664	2.9682	2.9626	2.9567	2.9526	2.9482
external 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
util living area			0.9839	0.9709	0.9454	0.8813	0.7680	0.6148	0.4810	0.5436	0.7644	0.9242	0.9736	0.9863 (86)
MIT 1			19.9678	19.2203	19.5913	20.0854	20.4990	20.7528	20.8456	20.8228	20.6073	20.0583	19.4321	19.2277 (87)
th2			20.1210	20.1220	20.1229	20.1274	20.1282	20.1321	20.1321	20.1329	20.1306	20.1282	20.1265	20.1248 (88)
util rest			0.9815	0.9666	0.9371	0.8628	0.7314	0.5537	0.3984	0.4596	0.7134	0.9085	0.9690	0.9842 (89)
MIT 2			19.1584	18.0098	18.4804	19.0992	19.5953	19.8795	19.9677	19.9512	19.7330	19.0770	18.2851	18.0995 (90)
Living area fraction =														0.1563 (91)
MIT			19.2849	18.1990	18.6541	19.2534	19.7366	20.0160	20.1049	20.0875	19.8697	19.2304	18.4644	18.2758 (92)
Temperature adjustment														0.0000
adjusted MIT			19.2849	18.1990	18.6541	19.2534	19.7366	20.0160	20.1049	20.0875	19.8697	19.2304	18.4644	18.2758 (93)

**8. Space heated requirement**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9787	0.9538	0.9191	0.8405	0.7129	0.5449	0.3957	0.4549	0.6958	0.8878	0.9568	0.9784	(94)
Useful gains W	1218.9186	1446.1977	1631.6418	1782.3360	1695.9382	1306.8760	902.3473	928.7632	1238.0498	1305.1618	1202.8547	1152.0365	(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	4092.8969	3628.0136	3311.7328	2805.3165	2175.2705	1458.7774	944.0341	992.2956	1556.9829	2336.0090	3082.5646	3826.5160	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for	2138.2398	1466.1803	1249.9877	736.5460	356.6232	0.0000	0.0000	0.0000	0.0000	766.9504	1353.3911	1989.8127	(98a)
Solar space heating contribution	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)
Total space heating requirement	2138.2398	1466.1803	1249.9877	736.5460	356.6232	0.0000	0.0000	0.0000	0.0000	766.9504	1353.3911	1989.8127	(98)
Space heating per m2													35.1669 (99)

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Utilisation	0.9787	0.9538	0.9191	0.8405	0.7129	0.5449	0.3957	0.4549	0.6958	0.8878	0.9568	0.9784	(94)
Useful gains W	1218.9186	1446.1977	1631.6418	1782.3360	1695.9382	1306.8760	902.3473	928.7632	1238.0498	1305.1618	1202.8547	1152.0365	(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	4092.8969	3628.0136	3311.7328	2805.3165	2175.2705	1458.7774	944.0341	992.2956	1556.9829	2336.0090	3082.5646	3826.5160	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for each month (kWh)	2138.2398	1466.1803	1249.9877	736.5460	356.6232	0.0000	0.0000	0.0000	0.0000	766.9504	1353.3911	1989.8127	(98a)
Solar space heating contribution (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)
Total space heating requirement (kWh/month)	2138.2398	1466.1803	1249.9877	736.5460	356.6232	0.0000	0.0000	0.0000	0.0000	766.9504	1353.3911	1989.8127	(98)
Space heating per m2												35.1669	(99)

**9. Energy requirements**

Fraction of space heat from secondary													0.0000	(201)
Fraction of space heat from main system													1.0000	(202)
Fraction of total space heat from main system 1													1.0000	(204)
Efficiency of main heating system 1													377.1357	(206)
Efficiency of secondary heating system													100.0000	(208)
Efficiency of water heater													175.5843	(216)
micro-CHP export													0.0000	(235d)
Space heating fuel - main system 1													2666.8731	(211)
Water heating fuel													1880.9965	(219)
Electricity for pumps and fans													0.0000	(231)
Electricity for lighting													363.5555	(232)
PV generation													-6586.7950	(233)
Micro-CHP generation													0.0000	(235)
Total delivered energy for all uses													-1675.3699	(238)

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Space heating efficiency (main heating system)	377.1357	377.1357	377.1357	377.1357	377.1357	0.0000	0.0000	0.0000	0.0000	377.1357	377.1357	377.1357	(210)
Space heating fuel (main heating system)	566.9682	388.7673	331.4424	195.3000	94.5610	0.0000	0.0000	0.0000	0.0000	203.3619	358.8605	527.6118	(211)
Water heating requirement	325.2610	288.0283	306.6137	270.6890	263.2337	238.0740	235.4315	244.1722	246.2129	273.5316	289.6647	321.8215	(64)
Water heating efficiency	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	(217)
Water heating fuel detail	185.2450	164.0399	174.6248	154.1647	149.9187	135.5896	134.0846	139.0627	140.2249	155.7837	164.9719	183.2861	(219)
Space cooling fuel total	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)
PV Generation in dwelling	122.0062	175.9288	257.3291	281.0424	284.3367	240.8258	237.1671	226.8100	204.6866	193.8540	132.9668	103.8553	(233a)
Wind Generation in dwelling	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)
Hydro Generation in dwelling	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)
micro-CHP in dwelling	-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)
PV Generation export	54.3196	126.3470	275.3547	453.1279	636.0783	668.5415	658.3780	547.5000	388.1981	197.7635	77.8493	42.5281	(233b)
Wind Generation export	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)
Hydro Generation export	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)

12. Carbon dioxide emissions																	
Space heating - main system														2666.8731	0.1360	413.5851	(261)
Water heating														1880.9965	0.1360	264.8033	(264)
Space and water heating																678.3884	(265)
Energy for lighting														0.0000	0.1360	52.4723	(268)
Electricity generated - PVs														-6586.7950	1.6660	-842.2019	(269)
Electricity generated - wind														-0.0000	1.6660	-0.0000	(269)
Electricity generated - hydro														-0.0000	1.6660	-0.0000	(269)
Electricity generated - mCHP														-0.0000	1.6660	-0.0000	(269)
Total kg/year																-111.3412	(272)

13. Primary energy																	
Space heating - main system														2666.8731	18.1590	4197.9625	(275)
Water heating														1880.9965	18.1590	2860.1319	(278)
Space and water heating																7058.0944	(279)
Pumps and fans														0.0000	1.5133	0.0000	(281)

**SAP 10 WORKSHEET (Version 10.2, December 2021)**  
**CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS**  
**COMPLIANCE**

Date 25/10/2023



**Complete Energy Consultancy Ltd**

The Exchange  
 Brickrow  
 Stroud  
 Tel: 07771 964593

Energy for lighting	363.5555	1.5133	557.6336	(282)
Electricity generated - PVs	-6586.7950	18.1590	-5560.2865	(283)
Electricity generated - wind	-0.0000	18.1590	-0.0000	(283)
Electricity generated - hydro	-0.0000	18.1590	-0.0000	(283)
Electricity generated - mCHP	-0.0000	18.1590	-0.0000	(283)
Total kg\year			2055.4415	(286)
EI value			100.4507	
Dwelling Carbon Dioxide Emission Rate (DER)			-0.39	(273) \ / (384)
Dwelling Primary Energy Rate (DPER)			7.19	(287) \ / (484)



# SAP 10 WORKSHEET (Version 10.2, December 2021) CALCULATION OF TARGET EMISSIONS



Complete Energy Consultancy Ltd

The Exchange  
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Tel: 07771 964593

Date 25/10/2023

Property	
UPRN	UPRN-0000000000
Address	Little Tresevern; Tresevern;

1 Overall dwelling dimensions				
Ground floor	140.0000	2.3500	329.0000	(1b) – (3b)
First floor	146.0000	2.6500	386.9000	(1c) – (3c)
Total floor area			286.0000	(4)
Dwelling volume (m <sup>3</sup> )			715.9000	(5)

2 Ventilation rate														
Number of chimneys														0 (6a)
Number of open flues														0 (6b)
Number of chimneys/flues to closed fires														0 (6c)
Number of flues to solid fuel boilers														0 (6d)
Number of flues attached to other heaters														0 (6d)
Number of blocked chimneys														0 (6f)
Number of intermittent fans														40 (7a)
Number of passive vents														0 (7b)
Number of flueless gas fires														0 (7c)
Infiltration due to chimneys, flues and fans														0.0559 (8)
Predicted Design q50(assumed)														5.0000 (17)
Infiltration rate														0.3059 (18)
Number of sides sheltered														2 (19)
Shelter factor														0.8500 (20)
Infiltration rate incorporating shelter factor														0.2600 (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		0.3315	0.3250	0.3185	0.2860	0.2795	0.2470	0.2470	0.2405	0.2600	0.2795	0.2925	0.3055	(22b)
Effective ach		0.5549	0.5528	0.5507	0.5409	0.5391	0.5305	0.5305	0.5289	0.5338	0.5391	0.5428	0.5467	(25)

**SAP 10 WORKSHEET (Version 10.2, December 2021)  
CALCULATION OF TARGET EMISSIONS**



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The Exchange  
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Date 25/10/2023

3. Heat losses and heat loss parameter																	
Windows (1)														54.8500	1.1450	62.8053	(27)
groundFloor														140.0000	0.1300	18.2000	75.0000 10500.0000 (28a)
exposeWall														92.0300	0.1800	34.5654	9.0000 1728.2700 (29a)
exposeWall														.1200	0.1800	1.1016	9.0000 55.0800 (29a)
exposeWall														9.0000	0.1800	3.4200	9.0000 171.0000 (29a)
exposedRoof														105.0000	0.1100	11.5500	9.0000 945.0000 (30)
exposedRoof														77.0000	0.1100	8.4700	9.0000 693.0000 (30)
exposedRoof														5.0000	0.1100	0.5500	9.0000 45.0000 (30)
Total area of external elements:																	599.0000 (31)
Fabric heat loss:																	140.6623 (33)
Heat capacity:																	14137.3500 (34)
Thermal mass parameter:																	100.0000 (35)
Thermal bridges:																	8.2640 (36)
Total fabric heat loss :																	148.9263 (37)
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Vent loss		131.1036	130.5996	130.1055	127.7850	127.3508	125.3297	125.3297	124.9554	126.1082	127.3508	128.2291	129.1474				(38)
Heat transfer coeff		280.0300	279.5259	279.0319	276.7113	276.2772	274.2560	274.2560	273.8818	275.0345	276.2772	277.1555	278.0737				(39)
Heat transfer coeff (average)																	276.7092 (39)
HLP		0.9791	0.9774	0.9756	0.9675	0.9660	0.9589	0.9589	0.9576	0.9617	0.9660	0.9691	0.9723				(40)
HLP (average)																	0.9675 (40)
Days in month		31.0000	28.0000	31.0000	30.0000	31.0000	30.0000	31.0000	31.0000	30.0000	31.0000	30.0000	31.0000				(41)
Heat losses and heat loss parameter																	complete

4. Water heating energy requirements																	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Assumed occupancy																	3.1137 (42)
Average daily hot water use (litres/day)																	143.3381 (43)
Mixer shower usage	76.4269	75.2784	73.6047	70.4025	68.0393	65.4039	63.9059	65.5669	67.3877	70.2173	73.4883	76.1341				(42a)	
Bath usage	32.9893	32.4994	31.8094	30.5373	29.5848	28.5285	27.9580	28.6431	29.3891	30.5193	31.8176	32.8778				(42b)	
Other usage	46.5177	44.8262	43.1346	41.4430	39.7515	38.0599	38.0599	39.7515	41.4430	43.1346	44.8262	46.5177				(42c)	

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Daily hot water use	155.9339	152.6039	148.5487	142.3828	137.3755	131.9924	129.9239	133.9615	138.2198	143.8712	150.1321	155.5296	(44)
Energy content	246.9612	217.3059	228.3139	194.9150	184.9339	162.3000	157.1317	165.8724	170.4389	195.2318	213.8907	243.5217	(45)
Energy content(annual)												2380.8169	(45)
Distribution loss	37.0442	32.5959	34.2471	29.2372	27.7401	24.3450	23.5698	24.8809	25.5658	29.2848	32.0836	36.5283	(46)
Cylinder volume												150.0000	(47)
Measured cylinder loss (kWh/day)												1.3938	(48)
Temperature factor												0.5400	(49)
Energy lost from water storage (kWh/day)												0.7527	(50)
Energy lost from cylinder in kWh/day												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
Net storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	293.5561	259.3916	274.9088	240.0068	231.5288	207.3919	203.7266	212.4673	215.5307	241.8267	258.9825	290.1166	(62)
WWHRS Saving	-34.9392	-30.9005	-32.3572	-26.7931	-24.9702	-21.3672	-20.0283	-21.2981	-22.1073	-26.0620	-29.5251	-34.2922	(63a)
PV Diverter Saving	-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 Saving	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)
WW heat rec.	-34.9392	-30.9005	-32.3572	-26.7931	-24.9702	-21.3672	-20.0283	-21.2981	-22.1073	-26.0620	-29.5251	-34.2922	(63)
Flue gas heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(G6)
Fghrs PV	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Output from w/h	258.6169	228.4911	242.5515	213.2137	206.5586	186.0247	183.6983	191.1692	193.4234	215.7647	229.4574	255.8244	(64)
Output from water heater(annual)												2604.7939	(64)
Instantaneous electric showers	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)
Heat gains (kWh)	119.3905	105.9228	113.1903	100.8827	98.7664	90.0382	89.5222	92.4285	92.7444	102.1905	107.1921	118.2469	(65)

5. Internal gains													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	(66)
Lighting	228.0778	252.5147	228.0778	235.6804	228.0778	235.6804	228.0778	228.0778	235.6804	228.0778	235.6804	228.0778	(67)
Appliances	446.8266	451.4633	439.7791	414.9047	383.5053	353.9943	334.2791	329.6424	341.3267	366.2010	397.6004	427.1115	(68)
Cooking	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	(69)

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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	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	(71)
Water heating	160.4711	157.6232	152.1375	140.1149	132.7506	125.0531	120.3256	124.2318	128.8117	137.3528	148.8779	158.9340	(72)
<b>Total internal</b>	<b>908.0815</b>	<b>934.3072</b>	<b>892.7003</b>	<b>863.4059</b>	<b>817.0396</b>	<b>784.4337</b>	<b>752.3884</b>	<b>751.6580</b>	<b>775.5247</b>	<b>804.3376</b>	<b>854.8647</b>	<b>886.8292</b>	<b>(73)</b>

6. Solar gains													
Windows (1)										54.8500	1.1450	62.8053	(27)
groundFloor								140.0000	0.1300	18.2000	75.0000	10500.0000	(28a)
exposeWall								92.0300	0.1800	34.5654	9.0000	1728.2700	(29a)
exposeWall								.1200	0.1800	1.1016	9.0000	55.0800	(29a)
exposeWall								9.0000	0.1800	3.4200	9.0000	171.0000	(29a)
exposedRoof								105.0000	0.1100	11.5500	9.0000	945.0000	(30)
exposedRoof								77.0000	0.1100	8.4700	9.0000	693.0000	(30)
exposedRoof								5.0000	0.1100	0.5500	9.0000	45.0000	(30)
Total area of external elements:												599.0000	(31)
Fabric heat loss:												140.6623	(33)
Heat capacity:												14137.3500	(34)
Thermal mass parameter:												100.0000	(35)
Thermal bridges:												8.2640	(36)
Total fabric heat loss :												148.9263	(37)
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Solar gains	321.9862	591.7675	924.7106	1338.5663	1675.2894	1740.5839	1645.8944	1382.8494	1066.1627	685.0438	393.5517	270.4500	(83)
<b>Total gains</b>	<b>1230.0677</b>	<b>1526.0746</b>	<b>1817.4109</b>	<b>2201.9722</b>	<b>2492.3291</b>	<b>2525.0176</b>	<b>2398.2828</b>	<b>2134.5074</b>	<b>1841.6874</b>	<b>1489.3814</b>	<b>1248.4164</b>	<b>1157.2792</b>	<b>(84)</b>

7. Mean internal temperature																
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Living room temperature during heating periods Th1													21.0000	(85)		
Heating system responsiveness													1.0000			
tau				28.3700	28.4211	28.4715	28.7102	28.7553	28.9673	28.9673	29.0068	28.8853	28.7553	28.6642	28.5696	
alpha				2.8913	2.8947	2.8981	2.9140	2.9170	2.9312	2.9312	2.9338	2.9257	2.9170	2.9109	2.9046	
external 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	
util living area				0.9844	0.9707	0.9433	0.8748	0.7559	0.5992	0.4674	0.5313	0.7563	0.9233	0.9743	0.9869	(86)

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MIT 1	18.3735	18.7104	19.2307	19.9177	20.4781	20.8150	20.9345	20.9040	20.6149	19.8591	18.9947	18.3183	(87)
th2	20.1008	20.1022	20.1037	20.1105	20.1118	20.1177	20.1177	20.1188	20.1154	20.1118	20.1092	20.1065	(88)
util rest	0.9820	0.9663	0.9346	0.8553	0.7181	0.5375	0.3851	0.4471	0.7041	0.9073	0.9697	0.9849	(89)
MIT 2	16.9725	17.4020	18.0615	18.9201	19.5897	19.9648	20.0774	20.0558	19.7652	18.8643	17.7714	16.9053	(90)
Living area fraction =												0.1563	(91)
MIT	17.1915	17.6065	18.2442	19.0760	19.7286	20.0977	20.2114	20.1884	19.8980	19.0197	17.9626	17.1261	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1915	17.6065	18.2442	19.0760	19.7286	20.0977	20.2114	20.1884	19.8980	19.0197	17.9626	17.1261	(93)

8. Space heated requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9702	0.9486	0.9103	0.8277	0.6998	0.5360	0.3943	0.4541	0.6894	0.8813	0.9534	0.9745	(94)
Useful gains W	1193.4497	1447.6970	1654.4046	1822.6143	1744.2231	1353.4308	945.5278	969.3294	1269.6729	1312.6301	1190.2023	1127.7477	(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	3609.9954	3551.8010	3277.0091	2815.8227	2218.1080	1507.7690	990.4378	1037.5638	1594.6523	2326.1816	3010.6233	3594.4218	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for	1797.9100	1413.9579	1207.2177	715.1100	352.5704	0.0000	0.0000	0.0000	0.0000	754.0823	1310.7032	1835.2055	(98a)
Solar space heating contribution	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)
Total space heating requirement	1797.9100	1413.9579	1207.2177	715.1100	352.5704	0.0000	0.0000	0.0000	0.0000	754.0823	1310.7032	1835.2055	(98)
Space heating per m2													32.8208 (99)
Utilisation	0.9702	0.9486	0.9103	0.8277	0.6998	0.5360	0.3943	0.4541	0.6894	0.8813	0.9534	0.9745	(94)
Useful gains W	1193.4497	1447.6970	1654.4046	1822.6143	1744.2231	1353.4308	945.5278	969.3294	1269.6729	1312.6301	1190.2023	1127.7477	(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	3609.9954	3551.8010	3277.0091	2815.8227	2218.1080	1507.7690	990.4378	1037.5638	1594.6523	2326.1816	3010.6233	3594.4218	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for each month (kWh)	1797.9100	1413.9579	1207.2177	715.1100	352.5704	0.0000	0.0000	0.0000	0.0000	754.0823	1310.7032	1835.2055	(98a)
Solar space heating contribution (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)
Total space heating requirement (kWh/month)	1797.9100	1413.9579	1207.2177	715.1100	352.5704	0.0000	0.0000	0.0000	0.0000	754.0823	1310.7032	1835.2055	(98)
Space heating per m2													32.8208 (99)

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9. Energy requirements														
Fraction of space heat from secondary														0.0000 (201)
Fraction of space heat from main system														1.0000 (202)
Fraction of total space heat from main system 1														1.0000 (204)
Efficiency of main heating system 1														92.3000 (206)
Efficiency of water heater														79.8000 (216)
micro-CHP export														0.0000 (235d)
Space heating fuel - main system 1														10169.8342 (211)
Water heating fuel														3072.7759 (219)
central heating pump														41.0000 (230c)
boiler flue fan														45.0000 (230e)
Electricity for pumps and fans														86.0000 (231)
Electricity for lighting														382.4650 (232)
PV generation														-6919.8508 (233)
Micro-CHP generation														0.0000 (235)
Total delivered energy for all uses														6791.2243 (238)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating efficiency (main heating system)	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)	1947.8982	1531.9154	1307.9281	774.7671	381.9831	0.0000	0.0000	0.0000	0.0000	816.9906	1420.0468	1988.3050	(211)	
Water heating requirement	258.6169	228.4911	242.5515	213.2137	206.5586	186.0247	183.6983	191.1692	193.4234	215.7647	229.4574	255.8244	(64)	
Water heating efficiency	87.5582	87.4283	87.1555	86.5579	85.2481	79.8000	79.8000	79.8000	79.8000	86.6265	87.3326	87.5914	(217)	
Water heating fuel detail	295.3658	261.3469	278.2975	246.3251	242.3028	233.1137	230.1984	239.5604	242.3852	249.0748	262.7397	292.0657	(219)	
Space cooling fuel total	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)	
PV Generation in dwelling	111.4802	148.1872	200.8454	212.3054	217.8482	199.1088	196.1847	190.1582	178.6045	162.2292	119.1039	97.4254	(233a)	
Wind Generation in dwelling	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)	
Hydro Generation in dwelling	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)	

**SAP 10 WORKSHEET (Version 10.2, December 2021)**  
**CALCULATION OF TARGET EMISSIONS**



**Complete Energy Consultancy Ltd**

The Exchange  
 Brickrow  
 Stroud  
 Tel: 07771 964593

Date 25/10/2023

micro-CHP in dwelling	-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	(235c)
PV Generation export	93.5074	192.1591	374.0492	550.9788	718.6600	718.9177	710.8596	606.6911	450.9173	271.5855	123.7060	74.3378		(233b)
Wind Generation export	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	(234b)
Hydro Generation export	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	(235b)

12. Carbon dioxide emissions																
Space heating - main system													10169.8342	0.2100	2135.6652	(261)
Water heating													3072.7759	0.2100	645.2829	(264)
Space and water heating															2780.9481	(265)
Pumps and fans													86.0000	0.1388	11.9293	(267)
Energy for lighting													0.0000	0.1360	55.2015	(268)
Electricity generated - PVs													-6919.8508	1.6660	-894.3718	(269)
Electricity generated - wind													-0.0000	1.6660	-0.0000	(269)
Electricity generated - hydro													-0.0000	1.6660	-0.0000	(269)
Electricity generated - mCHP													-0.0000	1.6660	-0.0000	(269)
Total kg/year															1953.7070	(272)

13. Primary energy																
Space heating - main system													10169.8342	13.5600	11491.9127	(275)
Water heating													3072.7759	13.5600	3472.2368	(278)
Space and water heating															14964.1494	(279)
Pumps and fans													86.0000	1.5133	130.1008	(281)
Energy for lighting													382.4650	1.5133	586.6375	(282)
Electricity generated - PVs													-6919.8508	18.1590	-5323.6593	(283)
Electricity generated - wind													-0.0000	18.1590	-0.0000	(283)
Electricity generated - hydro													-0.0000	18.1590	-0.0000	(283)
Electricity generated - mCHP													-0.0000	18.1590	-0.0000	(283)
Total kg/year															10357.2285	(286)
EI value															92.0907	
Target Carbon Dioxide EmissionRate(TER)															6.83	(273)
Target Primary Energy Rate (TPER)															36.21	(287)

# SAP 10 WORKSHEET (Version 10.2, December 2021) CALCULATION OF FABRIC ENERGY EFFICIENCY



Complete Energy Consultancy Ltd

The Exchange  
Brickrow  
Stroud  
Tel: 07771 964593

Date 25/10/2023

Property	
UPRN	UPRN-0000000000
Address	Little Tresevern; Tresevern;

1 Overall dwelling dimensions				
Ground floor	140.0000	2.3500	329.0000	(1b) – (3b)
First floor	146.0000	2.6500	386.9000	(1c) – (3c)
Total floor area			286.0000	(4)
Dwelling volume (m <sup>3</sup> )			715.9000	(5)

2 Ventilation rate														
Number of chimneys														0 (6a)
Number of open flues														0 (6b)
Number of chimneys/flues to closed fires														0 (6c)
Number of flues to solid fuel boilers														0 (6d)
Number of flues attached to other heaters														0 (6d)
Number of blocked chimneys														0 (6f)
Number of intermittent fans														40 (7a)
Number of passive vents														0 (7b)
Number of flueless gas fires														0 (7c)
Infiltration due to chimneys, flues and fans														0.0559 (8)
Predicted Design q50(assumed)														3.0000 (17)
Infiltration rate														0.2059 (18)
Number of sides sheltered														2 (19)
Shelter factor														0.8500 (20)
Infiltration rate incorporating shelter factor														0.1750 (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		0.2231	0.2187	0.2144	0.1925	0.1881	0.1662	0.1662	0.1619	0.1750	0.1881	0.1969	0.2056	(22b)
Effective ach		0.5249	0.5239	0.5230	0.5185	0.5177	0.5138	0.5138	0.5131	0.5153	0.5177	0.5194	0.5211	(25)



**SAP 10 WORKSHEET (Version 10.2, December 2021)  
CALCULATION OF FABRIC ENERGY EFFICIENCY**



**Complete Energy Consultancy Ltd**

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Brickrow  
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Tel: 07771 964593

Date 25/10/2023

3. Heat losses and heat loss parameter																				
Windows (1)														54.8500	0.9615	52.7404	(27)			
groundFloor														140.0000	0.1000	14.0000	75.0000	10500.0000	(28a)	
exposeWall														92.0300	0.1800	34.5654	9.0000	1728.2700	(29a)	
exposeWall														.1200	0.1800	1.1016	9.0000	55.0800	(29a)	
exposeWall														9.0000	0.1800	3.4200	9.0000	171.0000	(29a)	
exposedRoof														105.0000	0.1000	10.5000	9.0000	945.0000	(30)	
exposedRoof														77.0000	0.1500	11.5500	9.0000	693.0000	(30)	
exposedRoof														5.0000	0.1000	0.5000	9.0000	45.0000	(30)	
Total area of external elements:																		599.0000	(31)	
Fabric heat loss:																		128.3774	(33)	
Heat capacity:																		14137.3500	(34)	
Thermal mass parameter:																		100.0000	(35)	
Thermal bridges:																		18.1160	(36)	
Total fabric heat loss :																		146.4934	(37)	
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
Vent loss		124.0038	123.7754	123.5516	122.5003	122.3037	121.3880	121.3880	121.2185	121.7407	122.3037	122.7016	123.1175						(38)	
Heat transfer coeff		270.4971	270.2688	270.0450	268.9937	268.7970	267.8814	267.8814	267.7119	268.2341	268.7970	269.1949	269.6109						(39)	
Heat transfer coeff (average)																			268.9928	(39)
HLP		0.9458	0.9450	0.9442	0.9405	0.9398	0.9366	0.9366	0.9361	0.9379	0.9398	0.9412	0.9427						(40)	
HLP (average)																			0.9405	(40)
Days in month		31.0000	28.0000	31.0000	30.0000	31.0000	30.0000	31.0000	31.0000	30.0000	31.0000	30.0000	31.0000						(41)	
Heat losses and heat loss parameter																			complete	

4. Water heating energy requirements															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Assumed occupancy														3.1137	(42)
Average daily hot water use (litres/day)														72.8751	(43)
Mixer shower usage	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	(42a)	
Bath usage	32.9893	32.4994	31.8094	30.5373	29.5848	28.5285	27.9580	28.6431	29.3891	30.5193	31.8176	32.8778		(42b)	
Other usage	46.5177	44.8262	43.1346	41.4430	39.7515	38.0599	38.0599	39.7515	41.4430	43.1346	44.8262	46.5177		(42c)	

**SAP 10 WORKSHEET (Version 10.2, December 2021)  
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Daily hot water use	79.5070	77.3255	74.9440	71.9804	69.3363	66.5885	66.0180	68.3946	70.8321	73.6539	76.6437	79.3955	(44)
Energy content	125.9197	110.1105	115.1862	98.5375	93.3399	81.8783	79.8430	84.6868	87.3431	99.9476	109.1931	124.3141	(45)
Energy content(annual)												1210.2998	(45)
Distribution 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	(46)
Cylinder volume												0.0000	(47)
Energy lost from cylinder in kWh/day												0.0000	(55)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
Net storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total	107.0317	93.5939	97.9082	83.7569	79.3389	69.5966	67.8666	71.9838	74.2416	84.9555	92.8141	105.6670	(62)
WWHRS Saving	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 Saving	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 Saving	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)
WW heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Flue gas heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(G6)
Fghrs PV	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Output from w/h	107.0317	93.5939	97.9082	83.7569	79.3389	69.5966	67.8666	71.9838	74.2416	84.9555	92.8141	105.6670	(64)
Output from water heater(annual)												1028.7549	(64)
Instantaneous electric showers	61.2052	54.5344	59.5494	56.8273	57.8936	55.2249	57.0657	57.8936	56.8273	59.5494	58.4297	61.2052	(64a)
Heat gains (kWh)	42.0592	37.0321	39.3644	35.1460	34.3081	31.2054	31.2331	32.4694	32.7672	36.1262	37.8109	41.7181	(65)

5. Internal gains													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	(66)
Lighting	232.9931	257.9567	232.9931	240.7595	232.9931	240.7595	232.9931	232.9931	240.7595	232.9931	240.7595	232.9931	(67)
Appliances	446.8266	451.4633	439.7791	414.9047	383.5053	353.9943	334.2791	329.6424	341.3267	366.2010	397.6004	427.1115	(68)
Cooking	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	(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	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	(71)
Water heating	56.5312	55.1072	52.9092	48.8139	46.1131	43.3408	41.9799	43.6416	45.5100	48.5568	52.5152	56.0727	(72)

**SAP 10 WORKSHEET (Version 10.2, December 2021)**  
**CALCULATION OF FABRIC ENERGY EFFICIENCY**



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Date 25/10/2023

Total internal	806.0569	834.2332	795.3873	774.1841	732.3174	707.8005	678.9581	675.9831	697.3022	717.4568	760.5811	785.8832	(73)
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**6. Solar gains**

Windows (1)														54.8500	0.9615	52.7404	(27)		
groundFloor														140.0000	0.1000	14.0000	75.0000	10500.0000	(28a)
exposeWall														92.0300	0.1800	34.5654	9.0000	1728.2700	(29a)
exposeWall														.1200	0.1800	1.1016	9.0000	55.0800	(29a)
exposeWall														9.0000	0.1800	3.4200	9.0000	171.0000	(29a)
exposedRoof														105.0000	0.1000	10.5000	9.0000	945.0000	(30)
exposedRoof														77.0000	0.1500	11.5500	9.0000	693.0000	(30)
exposedRoof														5.0000	0.1000	0.5000	9.0000	45.0000	(30)
Total area of external elements:																		599.0000	(31)
Fabric heat loss:																		128.3774	(33)
Heat capacity:																		14137.3500	(34)
Thermal mass parameter:																		100.0000	(35)
Thermal bridges:																		18.1160	(36)
Total fabric heat loss :																		146.4934	(37)
		<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>						
Solar gains		291.3208	535.4087	836.6429	1211.0838	1515.7381	1574.8140	1489.1426	1251.1494	964.6234	619.8015	356.0705	244.6928	(83)					
Total gains		1097.3778	1369.6418	1632.0302	1985.2680	2248.0555	2282.6145	2168.1006	1927.1325	1661.9256	1337.2584	1116.6517	1030.5760	(84)					

**7. Mean internal temperature**

		<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>			
Living room temperature during heating periods Th1														21.0000	(85)	
Heating system responsiveness														1.0000		
tau				29.3698	29.3946	29.4190	29.5339	29.5555	29.6566	29.6566	29.6754	29.6176	29.5555	29.5119	29.4663	
alpha				2.9580	2.9596	2.9613	2.9689	2.9704	2.9771	2.9771	2.9784	2.9745	2.9704	2.9675	2.9644	
external 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	
util living area				0.9884	0.9774	0.9549	0.8954	0.7864	0.6338	0.4993	0.5659	0.7871	0.9383	0.9804	0.9904	(86)
MIT 1				18.3661	18.6877	19.1902	19.8643	20.4370	20.7938	20.9260	20.8915	20.5824	19.8152	18.9655	18.3046	(87)
th2				20.1287	20.1294	20.1301	20.1332	20.1338	20.1365	20.1365	20.1370	20.1354	20.1338	20.1326	20.1314	(88)
util rest				0.9867	0.9740	0.9478	0.8785	0.7513	0.5729	0.4152	0.4809	0.7385	0.9251	0.9769	0.9889	(89)

**SAP 10 WORKSHEET (Version 10.2, December 2021)  
CALCULATION OF FABRIC ENERGY EFFICIENCY**



**Complete Energy Consultancy Ltd**

The Exchange  
Brickrow  
Stroud  
Tel: 07771 964593

Date 25/10/2023

MIT 2	17.6742	17.9941	18.4918	19.1510	19.6892	20.0013	20.1002	20.0802	19.8341	19.1144	18.2745	17.6147	(90)
Living area fraction =												0.1563	(91)
MIT	17.7824	18.1025	18.6010	19.2625	19.8061	20.1252	20.2293	20.2070	19.9510	19.2239	18.3825	17.7225	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7824	18.1025	18.6010	19.2625	19.8061	20.1252	20.2293	20.2070	19.9510	19.2239	18.3825	17.7225	(93)

**8. Space heated requirement**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9798	0.9629	0.9316	0.8580	0.7363	0.5720	0.4247	0.4883	0.7266	0.9070	0.9669	0.9829	(94)
Useful gains W	1075.2036	1318.8894	1520.3509	1703.3702	1655.3058	1305.6744	920.8477	940.9662	1207.5324	1212.8404	1079.7012	1012.9933	(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	3646.9458	3568.2252	3267.8095	2787.4373	2178.8912	1480.0994	972.2111	1019.1830	1569.4465	2318.0795	3037.2017	3645.8139	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for	1913.3763	1511.5536	1300.1092	780.5283	389.5476	0.0000	0.0000	0.0000	0.0000	822.2979	1409.4004	1958.8185	(98a)
Solar space heating contribution	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)
Total space heating requirement	1913.3763	1511.5536	1300.1092	780.5283	389.5476	0.0000	0.0000	0.0000	0.0000	822.2979	1409.4004	1958.8185	(98)
Space heating per m2													35.2644 (99)
Utilisation	0.9798	0.9629	0.9316	0.8580	0.7363	0.5720	0.4247	0.4883	0.7266	0.9070	0.9669	0.9829	(94)
Useful gains W	1075.2036	1318.8894	1520.3509	1703.3702	1655.3058	1305.6744	920.8477	940.9662	1207.5324	1212.8404	1079.7012	1012.9933	(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	3646.9458	3568.2252	3267.8095	2787.4373	2178.8912	1480.0994	972.2111	1019.1830	1569.4465	2318.0795	3037.2017	3645.8139	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for each month (kWh)	1913.3763	1511.5536	1300.1092	780.5283	389.5476	0.0000	0.0000	0.0000	0.0000	822.2979	1409.4004	1958.8185	(98a)
Solar space heating contribution (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)
Total space heating requirement (kWh/month)	1913.3763	1511.5536	1300.1092	780.5283	389.5476	0.0000	0.0000	0.0000	0.0000	822.2979	1409.4004	1958.8185	(98)
Space heating per m2													35.2644 (99)

# SAP 10 WORKSHEET (Version 10.2, December 2021) OF TARGET FABRIC ENERGY EFFICIENCY



Complete Energy Consultancy Ltd

The Exchange  
Brickrow  
Stroud  
Tel: 07771 964593

Date 25/10/2023

Property	
UPRN	UPRN-0000000000
Address	Little Tresevern; Tresevern;

1 Overall dwelling dimensions				
Ground floor	140.0000	2.3500	329.0000	(1b) – (3b)
First floor	146.0000	2.6500	386.9000	(1c) – (3c)
Total floor area			286.0000	(4)
Dwelling volume (m <sup>3</sup> )			715.9000	(5)

2 Ventilation rate														
Number of chimneys														0 (6a)
Number of open flues														0 (6b)
Number of chimneys/flues to closed fires														0 (6c)
Number of flues to solid fuel boilers														0 (6d)
Number of flues attached to other heaters														0 (6d)
Number of blocked chimneys														0 (6f)
Number of intermittent fans														40 (7a)
Number of passive vents														0 (7b)
Number of flueless gas fires														0 (7c)
Infiltration due to chimneys, flues and fans														0.0559 (8)
Predicted Design q50(assumed)														5.0000 (17)
Infiltration rate														0.3059 (18)
Number of sides sheltered														2 (19)
Shelter factor														0.8500 (20)
Infiltration rate incorporating shelter factor														0.2600 (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	0.3315	0.3250	0.3185	0.2860	0.2795	0.2470	0.2470	0.2405	0.2600	0.2795	0.2925	0.3055		(22b)
Effective ach	0.5549	0.5528	0.5507	0.5409	0.5391	0.5305	0.5305	0.5289	0.5338	0.5391	0.5428	0.5467		(25)

# SAP 10 WORKSHEET (Version 10.2, December 2021) OF TARGET FABRIC ENERGY EFFICIENCY



Complete Energy Consultancy Ltd

The Exchange  
Brickrow  
Stroud  
Tel: 07771 964593

Date 25/10/2023

3. Heat losses and heat loss parameter																			
Windows (1)														54.8500	1.1450	62.8053	(27)		
groundFloor														140.0000	0.1300	18.2000	75.0000	10500.0000	(28a)
exposeWall														92.0300	0.1800	34.5654	9.0000	1728.2700	(29a)
exposeWall														.1200	0.1800	1.1016	9.0000	55.0800	(29a)
exposeWall														9.0000	0.1800	3.4200	9.0000	171.0000	(29a)
exposedRoof														105.0000	0.1100	11.5500	9.0000	945.0000	(30)
exposedRoof														77.0000	0.1100	8.4700	9.0000	693.0000	(30)
exposedRoof														5.0000	0.1100	0.5500	9.0000	45.0000	(30)
Total area of external elements:																		599.0000	(31)
Fabric heat loss:																		140.6623	(33)
Heat capacity:																		14137.3500	(34)
Thermal mass parameter:																		100.0000	(35)
Thermal bridges:																		8.2640	(36)
Total fabric heat loss :																		148.9263	(37)
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Vent loss		131.1036	130.5996	130.1055	127.7850	127.3508	125.3297	125.3297	124.9554	126.1082	127.3508	128.2291	129.1474						(38)
Heat transfer coeff		280.0300	279.5259	279.0319	276.7113	276.2772	274.2560	274.2560	273.8818	275.0345	276.2772	277.1555	278.0737						(39)
Heat transfer coeff (average)																			276.7092 (39)
HLP		0.9791	0.9774	0.9756	0.9675	0.9660	0.9589	0.9589	0.9576	0.9617	0.9660	0.9691	0.9723						(40)
HLP (average)																			0.9675 (40)
Days in month		31.0000	28.0000	31.0000	30.0000	31.0000	30.0000	31.0000	31.0000	30.0000	31.0000	30.0000	31.0000						(41)
Heat losses and heat loss parameter																			complete

4. Water heating energy requirements															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Assumed occupancy														3.1137	(42)
Average daily hot water use (litres/day)														72.8751	(43)
Mixer shower usage	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	(42a)	
Bath usage	32.9893	32.4994	31.8094	30.5373	29.5848	28.5285	27.9580	28.6431	29.3891	30.5193	31.8176	32.8778		(42b)	
Other usage	46.5177	44.8262	43.1346	41.4430	39.7515	38.0599	38.0599	39.7515	41.4430	43.1346	44.8262	46.5177		(42c)	

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Daily hot water use	79.5070	77.3255	74.9440	71.9804	69.3363	66.5885	66.0180	68.3946	70.8321	73.6539	76.6437	79.3955	(44)
Energy content	125.9197	110.1105	115.1862	98.5375	93.3399	81.8783	79.8430	84.6868	87.3431	99.9476	109.1931	124.3141	(45)
Energy content(annual)												1210.2998	(45)
Distribution 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	(46)
Cylinder volume												0.0000	(47)
Energy lost from cylinder in kWh/day												0.0000	(55)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
Net storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total	107.0317	93.5939	97.9082	83.7569	79.3389	69.5966	67.8666	71.9838	74.2416	84.9555	92.8141	105.6670	(62)
WWHRS Saving	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 Saving	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 Saving	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)
WW heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Flue gas heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(G6)
Fghrs PV	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Output from w/h	107.0317	93.5939	97.9082	83.7569	79.3389	69.5966	67.8666	71.9838	74.2416	84.9555	92.8141	105.6670	(64)
Output from water heater(annual)												1028.7549	(64)
Instantaneous electric showers	61.2052	54.5344	59.5494	56.8273	57.8936	55.2249	57.0657	57.8936	56.8273	59.5494	58.4297	61.2052	(64a)
Heat gains (kWh)	42.0592	37.0321	39.3644	35.1460	34.3081	31.2054	31.2331	32.4694	32.7672	36.1262	37.8109	41.7181	(65)

## 5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	155.6865	(66)
Lighting	228.0778	252.5147	228.0778	235.6804	228.0778	235.6804	228.0778	228.0778	235.6804	228.0778	235.6804	228.0778	(67)
Appliances	446.8266	451.4633	439.7791	414.9047	383.5053	353.9943	334.2791	329.6424	341.3267	366.2010	397.6004	427.1115	(68)
Cooking	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	38.5686	(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	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	(71)
Water heating	56.5312	55.1072	52.9092	48.8139	46.1131	43.3408	41.9799	43.6416	45.5100	48.5568	52.5152	56.0727	(72)

**SAP 10 WORKSHEET (Version 10.2, December 2021) OF TARGET FABRIC ENERGY EFFICIENCY**



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Total internal	801.1416	828.7912	790.4720	769.1050	727.4021	702.7214	674.0428	671.0678	692.2231	712.5415	755.5020	780.9679	(73)
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**6. Solar gains**

Windows (1)														54.8500	1.1450	62.8053	(27)		
groundFloor														140.0000	0.1300	18.2000	75.0000	10500.0000	(28a)
exposeWall														92.0300	0.1800	34.5654	9.0000	1728.2700	(29a)
exposeWall														.1200	0.1800	1.1016	9.0000	55.0800	(29a)
exposeWall														9.0000	0.1800	3.4200	9.0000	171.0000	(29a)
exposedRoof														105.0000	0.1100	11.5500	9.0000	945.0000	(30)
exposedRoof														77.0000	0.1100	8.4700	9.0000	693.0000	(30)
exposedRoof														5.0000	0.1100	0.5500	9.0000	45.0000	(30)
Total area of external elements:																		599.0000	(31)
Fabric heat loss:																		140.6623	(33)
Heat capacity:																		14137.3500	(34)
Thermal mass parameter:																		100.0000	(35)
Thermal bridges:																		8.2640	(36)
Total fabric heat loss :																		148.9263	(37)
		<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>						
Solar gains		321.9862	591.7675	924.7106	1338.5663	1675.2894	1740.5839	1645.8944	1382.8494	1066.1627	685.0438	393.5517	270.4500	(83)					
Total gains		1123.1278	1420.5587	1715.1826	2107.6713	2402.6916	2443.3053	2319.9372	2053.9172	1758.3858	1397.5853	1149.0536	1051.4178	(84)					

**7. Mean internal temperature**

		<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>			
Living room temperature during heating periods Th1														21.0000	(85)	
Heating system responsiveness														1.0000		
tau				28.3700	28.4211	28.4715	28.7102	28.7553	28.9673	28.9673	29.0068	28.8853	28.7553	28.6642	28.5696	
alpha				2.8913	2.8947	2.8981	2.9140	2.9170	2.9312	2.9312	2.9338	2.9257	2.9170	2.9109	2.9046	
external 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	
util living area				0.9877	0.9754	0.9504	0.8850	0.7691	0.6129	0.4804	0.5472	0.7730	0.9333	0.9791	0.9898	(86)
MIT 1				18.2964	18.6379	19.1666	19.8714	20.4506	20.8032	20.9295	20.8961	20.5892	19.8052	18.9252	18.2412	(87)
th2				20.1008	20.1022	20.1037	20.1105	20.1118	20.1177	20.1177	20.1188	20.1154	20.1118	20.1092	20.1065	(88)
util rest				0.9858	0.9717	0.9426	0.8667	0.7322	0.5511	0.3967	0.4618	0.7221	0.9190	0.9753	0.9882	(89)



**SAP 10 WORKSHEET (Version 10.2, December 2021) OF TARGET  
FABRIC ENERGY EFFICIENCY**



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Stroud  
Tel: 07771 964593

Date 25/10/2023

MIT 2	17.5864	17.9264	18.4500	19.1397	19.6816	19.9903	20.0837	20.0653	19.8220	19.0885	18.2189	17.5352	(90)
Living area fraction =												0.1563	(91)
MIT	17.6974	18.0376	18.5620	19.2541	19.8018	20.1174	20.2159	20.1952	19.9419	19.2005	18.3293	17.6456	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6974	18.0376	18.5620	19.2541	19.8018	20.1174	20.2159	20.1952	19.9419	19.2005	18.3293	17.6456	(93)

**8. Space heated requirement**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9598	0.9251	0.8455	0.7178	0.5511	0.4065	0.4697	0.7108	0.8999	0.9646	0.9818	(94)
Useful gains W	1098.8368	1363.4238	1586.6650	1781.9921	1724.5517	1346.3945	942.9443	964.6846	1249.7785	1257.7026	1108.3656	1032.3148	(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	3751.6778	3672.2991	3365.6821	2865.0952	2238.3467	1513.1739	991.6909	1039.4227	1606.7259	2376.1353	3112.2660	3738.8562	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for	1973.7137	1551.5642	1323.5887	779.8342	382.2635	0.0000	0.0000	0.0000	0.0000	832.1139	1442.8083	2013.6668	(98a)
Solar space heating contribution	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)
Total space heating requirement	1973.7137	1551.5642	1323.5887	779.8342	382.2635	0.0000	0.0000	0.0000	0.0000	832.1139	1442.8083	2013.6668	(98)
Space heating per m2													36.0124 (99)
Utilisation	0.9784	0.9598	0.9251	0.8455	0.7178	0.5511	0.4065	0.4697	0.7108	0.8999	0.9646	0.9818	(94)
Useful gains W	1098.8368	1363.4238	1586.6650	1781.9921	1724.5517	1346.3945	942.9443	964.6846	1249.7785	1257.7026	1108.3656	1032.3148	(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	3751.6778	3672.2991	3365.6821	2865.0952	2238.3467	1513.1739	991.6909	1039.4227	1606.7259	2376.1353	3112.2660	3738.8562	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for each month (kWh)	1973.7137	1551.5642	1323.5887	779.8342	382.2635	0.0000	0.0000	0.0000	0.0000	832.1139	1442.8083	2013.6668	(98a)
Solar space heating contribution (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)
Total space heating requirement (kWh/month)	1973.7137	1551.5642	1323.5887	779.8342	382.2635	0.0000	0.0000	0.0000	0.0000	832.1139	1442.8083	2013.6668	(98)
Space heating per m2													36.0124 (99)

# SAP 10 WORKSHEET (Version 10.2, December 2021)

## CALCULATION OF ENERGY RATINGS



Complete Energy Consultancy Ltd

The Exchange  
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Stroud  
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Date 25/10/2023

Property	
UPRN	UPRN-0000000000
Address	Little Tresevern; Tresevern;

1 Overall dwelling dimensions				
Ground floor	140.0000	2.3500	329.0000	(1b) – (3b)
First floor	146.0000	2.6500	386.9000	(1c) – (3c)
Total floor area			286.0000	(4)
Dwelling volume (m <sup>3</sup> )			715.9000	(5)

2 Ventilation rate														
Number of chimneys														0 (6a)
Number of open flues														0 (6b)
Number of chimneys/flues to closed fires														0 (6c)
Number of flues to solid fuel boilers														0 (6d)
Number of flues attached to other heaters														0 (6d)
Number of blocked chimneys														0 (6f)
Number of intermittent fans														70 (7a)
Number of passive vents														0 (7b)
Number of flueless gas fires														0 (7c)
Infiltration due to chimneys, flues and fans														0.0978 (8)
Predicted Design q50(assumed)														3.0000 (17)
Infiltration rate														0.2478 (18)
Number of sides sheltered														2 (19)
Shelter factor														0.8500 (20)
Infiltration rate incorporating shelter factor														0.2106 (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	0.2685	0.2633	0.2580	0.2317	0.2264	0.2001	0.2001	0.1948	0.2106	0.2264	0.2369	0.2475	(22b)	
Effective ach	0.5361	0.5347	0.5333	0.5268	0.5256	0.5200	0.5200	0.5190	0.5222	0.5256	0.5281	0.5306	(25)	

**SAP 10 WORKSHEET (Version 10.2, December 2021)  
CALCULATION OF ENERGY RATINGS**



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Date 25/10/2023

3. Heat losses and heat loss parameter												
Windows (1)									54.8500	0.9615	52.7404	(27)
groundFloor								140.0000	0.1000	14.0000	75.0000	10500.0000 (28a)
exposeWall								92.0300	0.1800	34.5654	9.0000	1728.2700 (29a)
exposeWall								.1200	0.1800	1.1016	9.0000	55.0800 (29a)
exposeWall								9.0000	0.1800	3.4200	9.0000	171.0000 (29a)
exposedRoof								105.0000	0.1000	10.5000	9.0000	945.0000 (30)
exposedRoof								77.0000	0.1500	11.5500	9.0000	693.0000 (30)
exposedRoof								5.0000	0.1000	0.5000	9.0000	45.0000 (30)
Total area of external elements:												599.0000 (31)
Fabric heat loss:												128.3774 (33)
Heat capacity:												14137.3500 (34)
Thermal mass parameter:												100.0000 (35)
Thermal bridges:												18.1160 (36)
Total fabric heat loss :												146.4934 (37)
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Vent loss	126.6412	126.3105	125.9863	124.4635	124.1786	122.8523	122.8523	122.6067	123.3632	124.1786	124.7549	125.3575 (38)
Heat transfer coeff	273.1346	272.8039	272.4797	270.9569	270.6720	269.3457	269.3457	269.1001	269.8565	270.6720	271.2483	271.8509 (39)
Heat transfer coeff (average)												270.9555 (39)
HLP	0.9550	0.9539	0.9527	0.9474	0.9464	0.9418	0.9418	0.9409	0.9436	0.9464	0.9484	0.9505 (40)
HLP (average)												0.9474 (40)
Days in month	31.0000	28.0000	31.0000	30.0000	31.0000	30.0000	31.0000	31.0000	30.0000	31.0000	30.0000	31.0000 (41)
heat pump calculation Output power												9040.0000
Design heat loss												6557.1234
Plant size ratio												1.3787
Service provision							space	and	water	heating	all	year
DHW vessel											separate	specified
Heating duration												variable
Secondary fraction												0.0000
Space heating thermal efficiency												377.1357
Summer thermal efficiency												175.5843

# SAP 10 WORKSHEET (Version 10.2, December 2021)

## CALCULATION OF ENERGY RATINGS



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Date 25/10/2023

Net space heating specific electricity generated	0.0000
Net water heating specific electricity generated	0.0000
Net annual electricity generated	0.0000
Heat losses and heat loss parameter	complete

4. Water heating energy requirements													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy													3.1137 (42)
Average daily hot water use (litres/day)													143.3381 (43)
Mixer shower usage	76.4269	75.2784	73.6047	70.4025	68.0393	65.4039	63.9059	65.5669	67.3877	70.2173	73.4883	76.1341	(42a)
Bath usage	32.9893	32.4994	31.8094	30.5373	29.5848	28.5285	27.9580	28.6431	29.3891	30.5193	31.8176	32.8778	(42b)
Other usage	46.5177	44.8262	43.1346	41.4430	39.7515	38.0599	38.0599	39.7515	41.4430	43.1346	44.8262	46.5177	(42c)
Daily hot water use	155.9339	152.6039	148.5487	142.3828	137.3755	131.9924	129.9239	133.9615	138.2198	143.8712	150.1321	155.5296	(44)
Energy content	246.9612	217.3059	228.3139	194.9150	184.9339	162.3000	157.1317	165.8724	170.4389	195.2318	213.8907	243.5217	(45)
Energy content(annual)													2380.8169 (45)
Distribution loss	37.0442	32.5959	34.2471	29.2372	27.7401	24.3450	23.5698	24.8809	25.5658	29.2848	32.0836	36.5283	(46)
Cylinder volume													110.0000 (47)
Measured cylinder loss (kWh/day)													2.0900 (48)
Temperature factor													0.5400 (49)
Energy lost from water storage (kWh/day)													1.1286 (50)
Energy lost from cylinder in kWh/day													1.1286 (55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
Net storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(57)
Primary loss	43.3132	39.1216	43.3132	41.9160	43.3132	41.9160	43.3132	43.3132	41.9160	43.3132	41.9160	43.3132	(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	325.2610	288.0283	306.6137	270.6890	263.2337	238.0740	235.4315	244.1722	246.2129	273.5316	289.6647	321.8215	(62)
WWHRS Saving	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 Saving	-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 Saving	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)
WW heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Flue gas heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(G6)

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Fghrs PV	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
Output from wVh	325.2610	288.0283	306.6137	270.6890	263.2337	238.0740	235.4315	244.1722	246.2129	273.5316	289.6647	321.8215	(64)
Output from water heater(annual)												3302.7339	(64)
Instantaneous electric showers	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)
Heat gains (kWh)	144.7544	128.8321	138.5542	125.4284	124.1304	114.5840	114.8861	117.7924	117.2901	127.5544	131.7378	143.6108	(65)

### 5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	(66)
Lighting	51.4650	45.7108	37.1745	28.1435	21.0376	17.7608	19.1912	24.9454	33.4817	42.5127	49.6186	52.8954	(67)
Appliances	666.9054	673.8258	656.3867	619.2608	572.3960	528.3496	498.9240	492.0036	509.4428	546.5687	593.4335	637.4798	(68)
Cooking	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	(69)
Pumps, fans	10.0000	10.0000	10.0000	10.0000	10.0000	0.0000	0.0000	0.0000	0.0000	10.0000	10.0000	10.0000	(70)
Losses	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	(71)
Water heating	194.5624	191.7145	186.2288	174.2061	166.8419	159.1444	154.4168	158.3231	162.9029	171.4441	182.9692	193.0253	(72)
Total internal	1042.0036	1040.3218	1008.8607	950.6811	889.3461	824.3256	791.6028	794.3429	824.8982	889.5963	955.0921	1012.4712	(73)

### 6. Solar gains

Windows (1)									54.8500	0.9615	52.7404	(27)
groundFloor							140.0000	0.1000	14.0000	75.0000	10500.0000	(28a)
exposeWall							92.0300	0.1800	34.5654	9.0000	1728.2700	(29a)
exposeWall							.1200	0.1800	1.1016	9.0000	55.0800	(29a)
exposeWall							9.0000	0.1800	3.4200	9.0000	171.0000	(29a)
exposedRoof							105.0000	0.1000	10.5000	9.0000	945.0000	(30)
exposedRoof							77.0000	0.1500	11.5500	9.0000	693.0000	(30)
exposedRoof							5.0000	0.1000	0.5000	9.0000	45.0000	(30)
Total area of external elements:											599.0000	(31)
Fabric heat loss:											128.3774	(33)
Heat capacity:											14137.3500	(34)
Thermal mass parameter:											100.0000	(35)
Thermal bridges:											18.1160	(36)
Total fabric heat loss :											146.4934	(37)

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## CALCULATION OF ENERGY RATINGS



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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	291.3208	535.4087	836.6429	1211.0838	1515.7381	1574.8140	1489.1426	1251.1494	964.6234	619.8015	356.0705	244.6928	(83)
Total gains	1333.3244	1575.7305	1845.5035	2161.7649	2405.0842	2399.1396	2280.7453	2045.4923	1789.5216	1509.3978	1311.1626	1257.1640	(84)

### 7. Mean internal temperature

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Living room temperature during heating periods Th1													21.0000 (85)	
Heating system responsiveness													0.7500	
tau			29.0862	29.1215	29.1561	29.3200	29.3508	29.4953	29.4953	29.5223	29.4395	29.3508	29.2885	29.2235
alpha			2.9391	2.9414	2.9437	2.9547	2.9567	2.9664	2.9664	2.9682	2.9626	2.9567	2.9526	2.9482
external 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
util living area			0.9808	0.9680	0.9403	0.8768	0.7640	0.6147	0.4809	0.5429	0.7623	0.9197	0.9707	0.9837 (86)
MIT 1			19.9920	19.2508	19.6240	20.1006	20.5051	20.7529	20.8457	20.8231	20.6096	20.0753	19.4601	19.2649 (87)
th2			20.1210	20.1220	20.1229	20.1274	20.1282	20.1321	20.1321	20.1329	20.1306	20.1282	20.1265	20.1248 (88)
util rest			0.9780	0.9633	0.9314	0.8577	0.7272	0.5536	0.3984	0.4589	0.7111	0.9033	0.9656	0.9813 (89)
MIT 2			19.1823	18.0483	18.5211	19.1173	19.6020	19.8796	19.9677	19.9514	19.7354	19.0976	18.3205	18.1446 (90)
Living area fraction =														0.1563 (91)
MIT			19.3089	18.2363	18.6935	19.2710	19.7432	20.0161	20.1049	20.0877	19.8721	19.2504	18.4986	18.3197 (92)
Temperature adjustment														0.0000
adjusted MIT			19.3089	18.2363	18.6935	19.2710	19.7432	20.0161	20.1049	20.0877	19.8721	19.2504	18.4986	18.3197 (93)

### 8. Space heated requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9748	0.9498	0.9127	0.8354	0.7089	0.5448	0.3956	0.4542	0.6937	0.8822	0.9527	0.9747	(94)
Useful gains W	1299.7765	1496.5877	1684.3147	1805.8390	1705.0470	1306.9835	902.3581	929.0662	1241.3384	1331.6653	1249.0909	1225.3074	(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	4099.4455	3638.1828	3322.4747	2810.0896	2177.0588	1458.7975	944.0361	992.3521	1557.6288	2341.4160	3091.8507	3838.4556	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for	2082.9538	1439.1519	1218.7910	723.0604	351.1768	0.0000	0.0000	0.0000	0.0000	751.2545	1326.7870	1944.1822	(98a)
Solar space heating contribution	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)
Total space heating requirement	2082.9538	1439.1519	1218.7910	723.0604	351.1768	0.0000	0.0000	0.0000	0.0000	751.2545	1326.7870	1944.1822	(98)
Space heating per m2													34.3964 (99)

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Utilisation	0.9748	0.9498	0.9127	0.8354	0.7089	0.5448	0.3956	0.4542	0.6937	0.8822	0.9527	0.9747	(94)
Useful gains W	1299.7765	1496.5877	1684.3147	1805.8390	1705.0470	1306.9835	902.3581	929.0662	1241.3384	1331.6653	1249.0909	1225.3074	(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	4099.4455	3638.1828	3322.4747	2810.0896	2177.0588	1458.7975	944.0361	992.3521	1557.6288	2341.4160	3091.8507	3838.4556	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for each month (kWh)	2082.9538	1439.1519	1218.7910	723.0604	351.1768	0.0000	0.0000	0.0000	0.0000	751.2545	1326.7870	1944.1822	(98a)
Solar space heating contribution (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)
Total space heating requirement (kWh/month)	2082.9538	1439.1519	1218.7910	723.0604	351.1768	0.0000	0.0000	0.0000	0.0000	751.2545	1326.7870	1944.1822	(98)
Space heating per m2												34.3964	(99)

**9. Energy requirements**

Fraction of space heat from secondary													0.0000	(201)
Fraction of space heat from main system													1.0000	(202)
Fraction of total space heat from main system 1													1.0000	(204)
Efficiency of main heating system 1													377.1357	(206)
Efficiency of secondary heating system													100.0000	(208)
Efficiency of water heater													175.5843	(216)
micro-CHP export													0.0000	(235d)
Space heating fuel - main system 1													2608.4396	(211)
Water heating fuel													1880.9965	(219)
Electricity for pumps and fans													0.0000	(231)
Electricity for lighting													363.5555	(232)
PV generation													-6586.7950	(233)
Micro-CHP generation													0.0000	(235)
Total delivered energy for all uses													-1733.8034	(238)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating efficiency (main heating system)	377.1357	377.1357	377.1357	377.1357	377.1357	0.0000	0.0000	0.0000	0.0000	377.1357	377.1357	377.1357	(210)
Space heating fuel (main heating system)	552.3088	381.6005	323.1704	191.7242	93.1168	0.0000	0.0000	0.0000	0.0000	199.2000	351.8062	515.5126	(211)
Water heating requirement	325.2610	288.0283	306.6137	270.6890	263.2337	238.0740	235.4315	244.1722	246.2129	273.5316	289.6647	321.8215	(64)
Water heating efficiency	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	(217)
Water heating fuel detail	185.2450	164.0399	174.6248	154.1647	149.9187	135.5896	134.0846	139.0627	140.2249	155.7837	164.9719	183.2861	(219)
Space cooling fuel total	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)
PV Generation in dwelling	121.7479	175.5982	256.5691	280.4525	283.9882	240.8258	237.1671	226.8100	204.6866	193.5004	132.7474	103.6779	(233a)
Wind Generation in dwelling	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)
Hydro Generation in dwelling	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)
micro-CHP in dwelling	-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)
PV Generation export	54.5780	126.6777	276.1146	453.7179	636.4268	668.5415	658.3780	547.5000	388.1981	198.1171	78.0687	42.7055	(233b)
Wind Generation export	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)
Hydro Generation export	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)

10. Fuel costs																		
Space heating - main system														2608.4396	16.4900	430.1317	(240)	
Water heating														1880.9965	16.4900	310.1763	(247)	
Electricity for lighting														363.5555	16.4900	59.9503	(250)	
Additional standing charges																0.0000	(251)	
Energy saving/generation technologies 1																-6586.7950	-636.0989	(252)
Total energy cost																	164.1594	(255)

11. Sap rating																		
Energy cost deflator																	0.3600	(256)
Energy cost factor (ECF)																	0.1785	(257)
SAP value																	97.1058	
SAP rating																	97	(258)
SAP BAND																	A	



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12. Carbon dioxide emissions				
Space heating - main system	2608.4396	0.1360	404.4780	(261)
Water heating	1880.9965	0.1360	264.8033	(264)
Space and water heating			669.2813	(265)
Energy for lighting	0.0000	0.1360	52.4723	(268)
Electricity generated - PVs	-6586.7950	1.6660	-842.2526	(269)
Electricity generated - wind	-0.0000	1.6660	-0.0000	(269)
Electricity generated - hydro	-0.0000	1.6660	-0.0000	(269)
Electricity generated - mCHP	-0.0000	1.6660	-0.0000	(269)
Total kg/year			-120.4990	(272)
CO2 emissions per m2			-0.42	(273)
EI value			100.4878	
EI rating			100	(274)
EI band			A	

13. Primary energy				
Space heating - main system	2608.4396	18.1590	4105.8154	(275)
Water heating	1880.9965	18.1590	2860.1319	(278)
Space and water heating			6965.9473	(279)
Pumps and fans	0.0000	1.5133	0.0000	(281)
Energy for lighting	363.5555	1.5133	557.6336	(282)
Electricity generated - PVs	-6586.7950	18.1590	-5557.4272	(283)
Electricity generated - wind	-0.0000	18.1590	-0.0000	(283)
Electricity generated - hydro	-0.0000	18.1590	-0.0000	(283)
Electricity generated - mCHP	-0.0000	18.1590	-0.0000	(283)
Total kg/year			1966.1537	(286)
EI value			100.4878	

# SAP 10 WORKSHEET (Version 10.2, December 2021) CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING



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Date 25/10/2023

Property	
UPRN	UPRN-0000000000
Address	Little Tresevern; Tresevern;

1 Overall dwelling dimensions				
Ground floor	140.0000	2.3500	329.0000	(1b) – (3b)
First floor	146.0000	2.6500	386.9000	(1c) – (3c)
Total floor area			286.0000	(4)
Dwelling volume (m <sup>3</sup> )			715.9000	(5)

2 Ventilation rate														
Number of chimneys														0 (6a)
Number of open flues														0 (6b)
Number of chimneys/flues to closed fires														0 (6c)
Number of flues to solid fuel boilers														0 (6d)
Number of flues attached to other heaters														0 (6d)
Number of blocked chimneys														0 (6f)
Number of intermittent fans														70 (7a)
Number of passive vents														0 (7b)
Number of flueless gas fires														0 (7c)
Infiltration due to chimneys, flues and fans														0.0978 (8)
Predicted Design q50(assumed)														3.0000 (17)
Infiltration rate														0.2478 (18)
Number of sides sheltered														2 (19)
Shelter factor														0.8500 (20)
Infiltration rate incorporating shelter factor														0.2106 (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	0.2685	0.2633	0.2580	0.2317	0.2264	0.2001	0.2001	0.1948	0.2106	0.2264	0.2369	0.2475		(22b)
Effective ach	0.5361	0.5347	0.5333	0.5268	0.5256	0.5200	0.5200	0.5190	0.5222	0.5256	0.5281	0.5306		(25)

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3. Heat losses and heat loss parameter												
Windows (1)									54.8500	0.9615	52.7404	(27)
groundFloor								140.0000	0.1000	14.0000	75.0000	10500.0000 (28a)
exposeWall								92.0300	0.1800	34.5654	9.0000	1728.2700 (29a)
exposeWall								.1200	0.1800	1.1016	9.0000	55.0800 (29a)
exposeWall								9.0000	0.1800	3.4200	9.0000	171.0000 (29a)
exposedRoof								105.0000	0.1000	10.5000	9.0000	945.0000 (30)
exposedRoof								77.0000	0.1500	11.5500	9.0000	693.0000 (30)
exposedRoof								5.0000	0.1000	0.5000	9.0000	45.0000 (30)
Total area of external elements:												599.0000 (31)
Fabric heat loss:												128.3774 (33)
Heat capacity:												14137.3500 (34)
Thermal mass parameter:												100.0000 (35)
Thermal bridges:												18.1160 (36)
Total fabric heat loss :												146.4934 (37)
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Vent loss	126.6412	126.3105	125.9863	124.4635	124.1786	122.8523	122.8523	122.6067	123.3632	124.1786	124.7549	125.3575 (38)
Heat transfer coeff	273.1346	272.8039	272.4797	270.9569	270.6720	269.3457	269.3457	269.1001	269.8565	270.6720	271.2483	271.8509 (39)
Heat transfer coeff (average)												270.9555 (39)
HLP	0.9550	0.9539	0.9527	0.9474	0.9464	0.9418	0.9418	0.9409	0.9436	0.9464	0.9484	0.9505 (40)
HLP (average)												0.9474 (40)
Days in month	31.0000	28.0000	31.0000	30.0000	31.0000	30.0000	31.0000	31.0000	30.0000	31.0000	30.0000	31.0000 (41)
heat pump calculation Output power												9040.0000
Design heat loss												6557.1234
Plant size ratio												1.3787
Service provision							space	and	water	heating	all	year
DHW vessel											separate	specified
Heating duration												variable
Secondary fraction												0.0000
Space heating thermal efficiency												377.1357
Summer thermal efficiency												175.5843

# SAP 10 WORKSHEET (Version 10.2, December 2021)

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Net space heating specific electricity generated	0.0000
Net water heating specific electricity generated	0.0000
Net annual electricity generated	0.0000
Heat losses and heat loss parameter	complete

4. Water heating energy requirements													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy													3.1137 (42)
Average daily hot water use (litres/day)													143.3381 (43)
Mixer shower usage	76.4269	75.2784	73.6047	70.4025	68.0393	65.4039	63.9059	65.5669	67.3877	70.2173	73.4883	76.1341	(42a)
Bath usage	32.9893	32.4994	31.8094	30.5373	29.5848	28.5285	27.9580	28.6431	29.3891	30.5193	31.8176	32.8778	(42b)
Other usage	46.5177	44.8262	43.1346	41.4430	39.7515	38.0599	38.0599	39.7515	41.4430	43.1346	44.8262	46.5177	(42c)
Daily hot water use	155.9339	152.6039	148.5487	142.3828	137.3755	131.9924	129.9239	133.9615	138.2198	143.8712	150.1321	155.5296	(44)
Energy content	246.9612	217.3059	228.3139	194.9150	184.9339	162.3000	157.1317	165.8724	170.4389	195.2318	213.8907	243.5217	(45)
Energy content(annual)													2380.8169 (45)
Distribution loss	37.0442	32.5959	34.2471	29.2372	27.7401	24.3450	23.5698	24.8809	25.5658	29.2848	32.0836	36.5283	(46)
Cylinder volume													110.0000 (47)
Measured cylinder loss (kWh/day)													2.0900 (48)
Temperature factor													0.5400 (49)
Energy lost from water storage (kWh/day)													1.1286 (50)
Energy lost from cylinder in kWh/day													1.1286 (55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
Net storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(57)
Primary loss	43.3132	39.1216	43.3132	41.9160	43.3132	41.9160	43.3132	43.3132	41.9160	43.3132	41.9160	43.3132	(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	325.2610	288.0283	306.6137	270.6890	263.2337	238.0740	235.4315	244.1722	246.2129	273.5316	289.6647	321.8215	(62)
WWHRS Saving	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 Saving	-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 Saving	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)
WW heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Flue gas heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(G6)

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Fghrs PV	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
Output from wVh	325.2610	288.0283	306.6137	270.6890	263.2337	238.0740	235.4315	244.1722	246.2129	273.5316	289.6647	321.8215	(64)
Output from water heater(annual)												3302.7339	(64)
Instantaneous electric showers	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)
Heat gains (kWh)	144.7544	128.8321	138.5542	125.4284	124.1304	114.5840	114.8861	117.7924	117.2901	127.5544	131.7378	143.6108	(65)

5. Internal gains													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	(66)
Lighting	51.4650	45.7108	37.1745	28.1435	21.0376	17.7608	19.1912	24.9454	33.4817	42.5127	49.6186	52.8954	(67)
Appliances	666.9054	673.8258	656.3867	619.2608	572.3960	528.3496	498.9240	492.0036	509.4428	546.5687	593.4335	637.4798	(68)
Cooking	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	(69)
Pumps, fans	10.0000	10.0000	10.0000	10.0000	10.0000	0.0000	0.0000	0.0000	0.0000	10.0000	10.0000	10.0000	(70)
Losses	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	(71)
Water heating	194.5624	191.7145	186.2288	174.2061	166.8419	159.1444	154.4168	158.3231	162.9029	171.4441	182.9692	193.0253	(72)
Total internal	1042.0036	1040.3218	1008.8607	950.6811	889.3461	824.3256	791.6028	794.3429	824.8982	889.5963	955.0921	1012.4712	(73)

6. Solar gains													
Windows (1)										54.8500	0.9615	52.7404	(27)
groundFloor							140.0000	0.1000	14.0000	75.0000	10500.0000		(28a)
exposeWall							92.0300	0.1800	34.5654	9.0000	1728.2700		(29a)
exposeWall							.1200	0.1800	1.1016	9.0000	55.0800		(29a)
exposeWall							9.0000	0.1800	3.4200	9.0000	171.0000		(29a)
exposedRoof							105.0000	0.1000	10.5000	9.0000	945.0000		(30)
exposedRoof							77.0000	0.1500	11.5500	9.0000	693.0000		(30)
exposedRoof							5.0000	0.1000	0.5000	9.0000	45.0000		(30)
Total area of external elements:												599.0000	(31)
Fabric heat loss:												128.3774	(33)
Heat capacity:												14137.3500	(34)
Thermal mass parameter:												100.0000	(35)
Thermal bridges:												18.1160	(36)
Total fabric heat loss :												146.4934	(37)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	291.3208	535.4087	836.6429	1211.0838	1515.7381	1574.8140	1489.1426	1251.1494	964.6234	619.8015	356.0705	244.6928	(83)
Total gains	1333.3244	1575.7305	1845.5035	2161.7649	2405.0842	2399.1396	2280.7453	2045.4923	1789.5216	1509.3978	1311.1626	1257.1640	(84)

**7. Mean internal temperature**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Living room temperature during heating periods Th1													21.0000 (85)	
Heating system responsiveness													0.7500	
tau			29.0862	29.1215	29.1561	29.3200	29.3508	29.4953	29.4953	29.5223	29.4395	29.3508	29.2885	29.2235
alpha			2.9391	2.9414	2.9437	2.9547	2.9567	2.9664	2.9664	2.9682	2.9626	2.9567	2.9526	2.9482
external 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
util living area			0.9808	0.9680	0.9403	0.8768	0.7640	0.6147	0.4809	0.5429	0.7623	0.9197	0.9707	0.9837 (86)
MIT 1			19.9920	19.2508	19.6240	20.1006	20.5051	20.7529	20.8457	20.8231	20.6096	20.0753	19.4601	19.2649 (87)
th2			20.1210	20.1220	20.1229	20.1274	20.1282	20.1321	20.1321	20.1329	20.1306	20.1282	20.1265	20.1248 (88)
util rest			0.9780	0.9633	0.9314	0.8577	0.7272	0.5536	0.3984	0.4589	0.7111	0.9033	0.9656	0.9813 (89)
MIT 2			19.1823	18.0483	18.5211	19.1173	19.6020	19.8796	19.9677	19.9514	19.7354	19.0976	18.3205	18.1446 (90)
Living area fraction =														0.1563 (91)
MIT			19.3089	18.2363	18.6935	19.2710	19.7432	20.0161	20.1049	20.0877	19.8721	19.2504	18.4986	18.3197 (92)
Temperature adjustment														0.0000
adjusted MIT			19.3089	18.2363	18.6935	19.2710	19.7432	20.0161	20.1049	20.0877	19.8721	19.2504	18.4986	18.3197 (93)

**8. Space heated requirement**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9748	0.9498	0.9127	0.8354	0.7089	0.5448	0.3956	0.4542	0.6937	0.8822	0.9527	0.9747	(94)
Useful gains W	1299.7765	1496.5877	1684.3147	1805.8390	1705.0470	1306.9835	902.3581	929.0662	1241.3384	1331.6653	1249.0909	1225.3074	(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	4099.4455	3638.1828	3322.4747	2810.0896	2177.0588	1458.7975	944.0361	992.3521	1557.6288	2341.4160	3091.8507	3838.4556	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for	2082.9538	1439.1519	1218.7910	723.0604	351.1768	0.0000	0.0000	0.0000	0.0000	751.2545	1326.7870	1944.1822	(98a)
Solar space heating contribution	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)
Total space heating requirement	2082.9538	1439.1519	1218.7910	723.0604	351.1768	0.0000	0.0000	0.0000	0.0000	751.2545	1326.7870	1944.1822	(98)
Space heating per m2													34.3964 (99)

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Utilisation	0.9748	0.9498	0.9127	0.8354	0.7089	0.5448	0.3956	0.4542	0.6937	0.8822	0.9527	0.9747	(94)
Useful gains W	1299.7765	1496.5877	1684.3147	1805.8390	1705.0470	1306.9835	902.3581	929.0662	1241.3384	1331.6653	1249.0909	1225.3074	(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	4099.4455	3638.1828	3322.4747	2810.0896	2177.0588	1458.7975	944.0361	992.3521	1557.6288	2341.4160	3091.8507	3838.4556	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for each month (kWh)	2082.9538	1439.1519	1218.7910	723.0604	351.1768	0.0000	0.0000	0.0000	0.0000	751.2545	1326.7870	1944.1822	(98a)
Solar space heating contribution (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)
Total space heating requirement (kWh/month)	2082.9538	1439.1519	1218.7910	723.0604	351.1768	0.0000	0.0000	0.0000	0.0000	751.2545	1326.7870	1944.1822	(98)
Space heating per m2												34.3964	(99)

**9. Energy requirements**

Fraction of space heat from secondary													0.0000	(201)
Fraction of space heat from main system													1.0000	(202)
Fraction of total space heat from main system 1													1.0000	(204)
Efficiency of main heating system 1													377.1357	(206)
Efficiency of secondary heating system													100.0000	(208)
Efficiency of water heater													175.5843	(216)
micro-CHP export													0.0000	(235d)
Space heating fuel - main system 1													2608.4396	(211)
Water heating fuel													1880.9965	(219)
Electricity for pumps and fans													0.0000	(231)
Electricity for lighting													363.5555	(232)
PV generation													-6586.7950	(233)
Wind generation													-3575.5408	(234)
Micro-CHP generation													0.0000	(235)

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Date 25/10/2023

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total delivered energy for all uses													-5309.3441 (238)
Space heating efficiency (main heating system)	377.1357	377.1357	377.1357	377.1357	377.1357	0.0000	0.0000	0.0000	0.0000	377.1357	377.1357	377.1357	(210)
Space heating fuel (main heating system)	552.3088	381.6005	323.1704	191.7242	93.1168	0.0000	0.0000	0.0000	0.0000	199.2000	351.8062	515.5126	(211)
Water heating requirement	325.2610	288.0283	306.6137	270.6890	263.2337	238.0740	235.4315	244.1722	246.2129	273.5316	289.6647	321.8215	(64)
Water heating efficiency	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	175.5843	(217)
Water heating fuel detail	185.2450	164.0399	174.6248	154.1647	149.9187	135.5896	134.0846	139.0627	140.2249	155.7837	164.9719	183.2861	(219)
Space cooling fuel total	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)
PV Generation in dwelling	121.7479	175.5982	256.5691	280.4525	283.9882	240.8258	237.1671	226.8100	204.6866	193.5004	132.7474	103.6779	(233a)
Wind Generation in dwelling	212.5732	192.0016	212.5732	205.7160	212.5732	205.7160	212.5732	212.5732	205.7160	212.5732	205.7160	212.5732	(234a)
Hydro Generation in dwelling	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)
micro-CHP in dwelling	-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)
PV Generation export	54.5780	126.6777	276.1146	453.7179	636.4268	668.5415	658.3780	547.5000	388.1981	198.1171	78.0687	42.7055	(233b)
Wind Generation export	91.1028	82.2864	91.1028	88.1640	91.1028	88.1640	91.1028	91.1028	88.1640	91.1028	88.1640	91.1028	(234b)
Hydro Generation export	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)

10. Fuel costs														
Space heating - main system														2608.4396 16.4900 430.1317 (240)
Water heating														1880.9965 16.4900 310.1763 (247)
Electricity for lighting														363.5555 16.4900 59.9503 (250)
Additional standing charges														0.0000 (251)
Energy saving\generation technologies 1														-6586.7950 -636.0989 (252)
Energy saving\generation technologies 2														-3575.5408 16.4900 -472.6865 (252)
Total energy cost														-308.5271 (255)

11. Sap rating														
Energy cost deflator														0.3600 (256)
Energy cost factor (ECF)														-0.3356 (257)
SAP value														105.4394
SAP rating														105 (258)
SAP BAND														A



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Date 25/10/2023

12. Carbon dioxide emissions				
Space heating - main system	2608.4396	0.1360	404.4780	(261)
Water heating	1880.9965	0.1360	264.8033	(264)
Space and water heating			669.2813	(265)
Energy for lighting	0.0000	0.1360	52.4723	(268)
Electricity generated - PVs	-6586.7950	1.6660	-842.2526	(269)
Electricity generated - wind	-3575.5408	1.6660	-495.9716	(269)
Electricity generated - hydro	-0.0000	1.6660	-0.0000	(269)
Electricity generated - mCHP	-0.0000	1.6660	-0.0000	(269)
Total kg/year			-616.4706	(272)
CO2 emissions per m2			-2.16	(273)
EI value			102.4957	
EI rating			102	(274)
EI band			A	

13. Primary energy				
Space heating - main system	2608.4396	18.1590	4105.8154	(275)
Water heating	1880.9965	18.1590	2860.1319	(278)
Space and water heating			6965.9473	(279)
Pumps and fans	0.0000	1.5133	0.0000	(281)
Energy for lighting	363.5555	1.5133	557.6336	(282)
Electricity generated - PVs	-6586.7950	18.1590	-5557.4272	(283)
Electricity generated - wind	-3575.5408	18.1590	-4336.4158	(283)
Electricity generated - hydro	-0.0000	18.1590	-0.0000	(283)
Electricity generated - mCHP	-0.0000	18.1590	-0.0000	(283)
Total kg/year			-2370.2621	(286)
EI value			102.4957	

# SAP 10 WORKSHEET (Version 10.2, December 2021) CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

Date 25/10/2023



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Property	
UPRN	UPRN-000000000
Address	Little Tresevern; Tresevern;

1 Overall dwelling dimensions				
Ground floor	140.0000	2.3500	329.0000	(1b) – (3b)
First floor	146.0000	2.6500	386.9000	(1c) – (3c)
Total floor area			286.0000	(4)
Dwelling volume (m <sup>3</sup> )			715.9000	(5)

2 Ventilation rate														
Number of chimneys														0 (6a)
Number of open flues														0 (6b)
Number of chimneys/flues to closed fires														0 (6c)
Number of flues to solid fuel boilers														0 (6d)
Number of flues attached to other heaters														0 (6d)
Number of blocked chimneys														0 (6f)
Number of intermittent fans														70 (7a)
Number of passive vents														0 (7b)
Number of flueless gas fires														0 (7c)
Infiltration due to chimneys, flues and fans														0.0978 (8)
Predicted Design q50(assumed)														3.0000 (17)
Infiltration rate														0.2478 (18)
Number of sides sheltered														2 (19)
Shelter factor														0.8500 (20)
Infiltration rate incorporating shelter factor														0.2106 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind speed	5.8000	5.5000	5.5000	5.0000	4.9000	4.3000	4.3000	4.1000	4.5000	5.1000	5.1000	5.7000	(22)	
Wind factor	1.4500	1.3750	1.3750	1.2500	1.2250	1.0750	1.0750	1.0250	1.1250	1.2750	1.2750	1.4250	(22a)	
Adj infilt rate	0.3054	0.2896	0.2896	0.2633	0.2580	0.2264	0.2264	0.2159	0.2369	0.2685	0.2685	0.3001	(22b)	
Effective ach	0.5466	0.5419	0.5419	0.5347	0.5333	0.5256	0.5256	0.5233	0.5281	0.5361	0.5361	0.5450	(25)	

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3. Heat losses and heat loss parameter												
Windows (1)									54.8500	0.9615	52.7404	(27)
groundFloor								140.0000	0.1000	14.0000	75.0000	10500.0000 (28a)
exposeWall								92.0300	0.1800	34.5654	9.0000	1728.2700 (29a)
exposeWall								.1200	0.1800	1.1016	9.0000	55.0800 (29a)
exposeWall								9.0000	0.1800	3.4200	9.0000	171.0000 (29a)
exposedRoof								105.0000	0.1000	10.5000	9.0000	945.0000 (30)
exposedRoof								77.0000	0.1500	11.5500	9.0000	693.0000 (30)
exposedRoof								5.0000	0.1000	0.5000	9.0000	45.0000 (30)
Total area of external elements:												599.0000 (31)
Fabric heat loss:												128.3774 (33)
Heat capacity:												14137.3500 (34)
Thermal mass parameter:												100.0000 (35)
Thermal bridges:												18.1160 (36)
Total fabric heat loss :												146.4934 (37)
		<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>
Vent loss	129.1399	128.0297	128.0297	126.3105	125.9863	124.1786	124.1786	123.6284	124.7549	126.6412	126.6412	128.7633 (38)
Heat transfer coeff	275.6333	274.5231	274.5231	272.8039	272.4797	270.6720	270.6720	270.1218	271.2483	273.1346	273.1346	275.2567 (39)
Heat transfer coeff (average)												272.8502 (39)
HLP	0.9638	0.9599	0.9599	0.9539	0.9527	0.9464	0.9464	0.9445	0.9484	0.9550	0.9550	0.9624 (40)
HLP (average)												0.9540 (40)
Days in month	31.0000	28.0000	31.0000	30.0000	31.0000	30.0000	31.0000	31.0000	30.0000	31.0000	30.0000	31.0000 (41)
heat pump calculation Output power												9040.0000
Design heat loss												6602.9760
Plant size ratio												1.3691
Service provision							space	and	water	heating	all	year
DHW vessel											separate	specified
Heating duration												variable
Secondary fraction												0.0000
Space heating thermal efficiency												377.0599
Summer thermal efficiency												175.5862

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Net space heating specific electricity generated	0.0000
Net water heating specific electricity generated	0.0000
Net annual electricity generated	0.0000
Heat losses and heat loss parameter	complete

4. Water heating energy requirements													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy													3.1137 (42)
Average daily hot water use (litres/day)													143.3381 (43)
Mixer shower usage	76.4269	75.2784	73.6047	70.4025	68.0393	65.4039	63.9059	65.5669	67.3877	70.2173	73.4883	76.1341	(42a)
Bath usage	32.9893	32.4994	31.8094	30.5373	29.5848	28.5285	27.9580	28.6431	29.3891	30.5193	31.8176	32.8778	(42b)
Other usage	46.5177	44.8262	43.1346	41.4430	39.7515	38.0599	38.0599	39.7515	41.4430	43.1346	44.8262	46.5177	(42c)
Daily hot water use	155.9339	152.6039	148.5487	142.3828	137.3755	131.9924	129.9239	133.9615	138.2198	143.8712	150.1321	155.5296	(44)
Energy content	246.9612	217.3059	228.3139	194.9150	184.9339	162.3000	157.1317	165.8724	170.4389	195.2318	213.8907	243.5217	(45)
Energy content(annual)													2380.8169 (45)
Distribution loss	37.0442	32.5959	34.2471	29.2372	27.7401	24.3450	23.5698	24.8809	25.5658	29.2848	32.0836	36.5283	(46)
Cylinder volume													110.0000 (47)
Measured cylinder loss (kWh/day)													2.0900 (48)
Temperature factor													0.5400 (49)
Energy lost from water storage (kWh/day)													1.1286 (50)
Energy lost from cylinder in kWh/day													1.1286 (55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
Net storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(57)
Primary loss	43.3132	39.1216	43.3132	41.9160	43.3132	41.9160	43.3132	43.3132	41.9160	43.3132	41.9160	43.3132	(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	325.2610	288.0283	306.6137	270.6890	263.2337	238.0740	235.4315	244.1722	246.2129	273.5316	289.6647	321.8215	(62)
WWHRS Saving	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 Saving	-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 Saving	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)
WW heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Flue gas heat rec.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(G6)

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Fghrs PV	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
Output from w/h	325.2610	288.0283	306.6137	270.6890	263.2337	238.0740	235.4315	244.1722	246.2129	273.5316	289.6647	321.8215	(64)
Output from water heater(annual)												3302.7339	(64)
Instantaneous electric showers	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)
Heat gains (kWh)	144.7544	128.8321	138.5542	125.4284	124.1304	114.5840	114.8861	117.7924	117.2901	127.5544	131.7378	143.6108	(65)

5. Internal gains													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	(66)
Lighting	51.4650	45.7108	37.1745	28.1435	21.0376	17.7608	19.1912	24.9454	33.4817	42.5127	49.6186	52.8954	(67)
Appliances	666.9054	673.8258	656.3867	619.2608	572.3960	528.3496	498.9240	492.0036	509.4428	546.5687	593.4335	637.4798	(68)
Cooking	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	(69)
Pumps, fans	10.0000	10.0000	10.0000	10.0000	10.0000	0.0000	0.0000	0.0000	0.0000	10.0000	10.0000	10.0000	(70)
Losses	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	(71)
Water heating	194.5624	191.7145	186.2288	174.2061	166.8419	159.1444	154.4168	158.3231	162.9029	171.4441	182.9692	193.0253	(72)
Total internal	1042.0036	1040.3218	1008.8607	950.6811	889.3461	824.3256	791.6028	794.3429	824.8982	889.5963	955.0921	1012.4712	(73)

6. Solar gains													
Windows (1)										54.8500	0.9615	52.7404	(27)
groundFloor							140.0000	0.1000	14.0000	75.0000	10500.0000		(28a)
exposeWall							92.0300	0.1800	34.5654	9.0000	1728.2700		(29a)
exposeWall							.1200	0.1800	1.1016	9.0000	55.0800		(29a)
exposeWall							9.0000	0.1800	3.4200	9.0000	171.0000		(29a)
exposedRoof							105.0000	0.1000	10.5000	9.0000	945.0000		(30)
exposedRoof							77.0000	0.1500	11.5500	9.0000	693.0000		(30)
exposedRoof							5.0000	0.1000	0.5000	9.0000	45.0000		(30)
Total area of external elements:												599.0000	(31)
Fabric heat loss:												128.3774	(33)
Heat capacity:												14137.3500	(34)
Thermal mass parameter:												100.0000	(35)
Thermal bridges:												18.1160	(36)
Total fabric heat loss :												146.4934	(37)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	382.3157	607.0858	949.2041	1404.8797	1661.8294	1882.7678	1629.8949	1471.9541	1158.3478	741.0181	451.0709	319.5906	(83)
<b>Total gains</b>	<b>1424.3193</b>	<b>1647.4076</b>	<b>1958.0648</b>	<b>2355.5608</b>	<b>2551.1756</b>	<b>2707.0934</b>	<b>2421.4976</b>	<b>2266.2970</b>	<b>1983.2460</b>	<b>1630.6144</b>	<b>1406.1630</b>	<b>1332.0618</b>	<b>(84)</b>

**7. Mean internal temperature**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Living room temperature during heating periods Th1													21.0000 (85)	
Heating system responsiveness													0.7500	
tau			28.8225	28.9391	28.9391	29.1215	29.1561	29.3508	29.3508	29.4106	29.2885	29.0862	29.0862	28.8620
alpha			2.9215	2.9293	2.9293	2.9414	2.9437	2.9567	2.9567	2.9607	2.9526	2.9391	2.9391	2.9241
external Temp			6.3000	6.6000	7.6000	9.1000	11.6000	14.3000	16.0000	16.0000	14.3000	11.8000	9.0000	6.7000
util living area			0.9689	0.9536	0.9195	0.8511	0.7479	0.5848	0.5099	0.5363	0.7135	0.8796	0.9508	0.9718 (86)
MIT 1			20.1649	19.5315	19.8200	20.1834	20.5208	20.7637	20.8279	20.8184	20.6648	20.2770	19.7826	19.6102 (87)
th2			20.1136	20.1169	20.1169	20.1220	20.1229	20.1282	20.1282	20.1299	20.1265	20.1210	20.1210	20.1148 (88)
util rest			0.9638	0.9463	0.9070	0.8290	0.7104	0.5269	0.4350	0.4596	0.6571	0.8541	0.9413	0.9670 (89)
MIT 2			19.3479	18.4018	18.7628	19.2121	19.6134	19.8834	19.9477	19.9422	19.7886	19.3393	18.7257	18.5577 (90)
Living area fraction =														0.1563 (91)
MIT			19.4756	18.5783	18.9281	19.3639	19.7553	20.0210	20.0852	20.0791	19.9256	19.4859	18.8909	18.7222 (92)
Temperature adjustment														0.0000
adjusted MIT			19.4756	18.5783	18.9281	19.3639	19.7553	20.0210	20.0852	20.0791	19.9256	19.4859	18.8909	18.7222 (93)

**8. Space heated requirement**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9595	0.9294	0.8860	0.8068	0.6929	0.5193	0.4310	0.4549	0.6426	0.8314	0.9238	0.9570	(94)
Useful gains W	1366.6432	1531.1703	1734.7592	1900.3531	1767.5833	1405.7753	1043.7839	1030.8449	1274.4026	1355.7610	1299.0428	1274.8324	(95)
Ext temp.	6.3000	6.6000	7.6000	9.1000	11.6000	14.3000	16.0000	16.0000	14.3000	11.8000	9.0000	6.7000	(96)
Heat loss rate W	3631.6397	3288.3270	3109.8176	2800.0318	2222.1412	1548.5079	1105.7554	1101.8644	1525.9256	2099.2746	2701.5503	3309.1982	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for	1685.1573	1180.8093	1023.0435	647.7687	338.1910	0.0000	0.0000	0.0000	0.0000	553.1741	1009.8054	1513.5682	(98a)
Solar space heating contribution	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)
<b>Total space heating requirement</b>	<b>1685.1573</b>	<b>1180.8093</b>	<b>1023.0435</b>	<b>647.7687</b>	<b>338.1910</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>553.1741</b>	<b>1009.8054</b>	<b>1513.5682</b>	<b>(98)</b>
Space heating per m2													27.8025 (99)

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Utilisation	0.9595	0.9294	0.8860	0.8068	0.6929	0.5193	0.4310	0.4549	0.6426	0.8314	0.9238	0.9570	(94)
Useful gains W	1366.6432	1531.1703	1734.7592	1900.3531	1767.5833	1405.7753	1043.7839	1030.8449	1274.4026	1355.7610	1299.0428	1274.8324	(95)
Ext temp.	6.3000	6.6000	7.6000	9.1000	11.6000	14.3000	16.0000	16.0000	14.3000	11.8000	9.0000	6.7000	(96)
Heat loss rate W	3631.6397	3288.3270	3109.8176	2800.0318	2222.1412	1548.5079	1105.7554	1101.8644	1525.9256	2099.2746	2701.5503	3309.1982	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for each month (kWh)	1685.1573	1180.8093	1023.0435	647.7687	338.1910	0.0000	0.0000	0.0000	0.0000	553.1741	1009.8054	1513.5682	(98a)
Solar space heating contribution (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)
Total space heating requirement (kWh/month)	1685.1573	1180.8093	1023.0435	647.7687	338.1910	0.0000	0.0000	0.0000	0.0000	553.1741	1009.8054	1513.5682	(98)
Space heating per m2												27.8025	(99)

**9. Energy requirements**

Fraction of space heat from secondary													0.0000	(201)
Fraction of space heat from main system													1.0000	(202)
Fraction of total space heat from main system 1													1.0000	(204)
Efficiency of main heating system 1													377.0599	(206)
Efficiency of secondary heating system													100.0000	(208)
Efficiency of water heater													175.5862	(216)
micro-CHP export													0.0000	(235d)
Space heating fuel - main system 1													2108.8210	(211)
Water heating fuel													1880.9760	(219)
Electricity for pumps and fans													0.0000	(231)
Electricity for lighting													363.5555	(232)
PV generation													-7606.8079	(233)
Micro-CHP generation													0.0000	(235)
Total delivered energy for all uses													-3253.4554	(238)

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Space heating efficiency (main heating system)	377.0599	377.0599	377.0599	377.0599	377.0599	0.0000	0.0000	0.0000	0.0000	377.0599	377.0599	377.0599	(210)
Space heating fuel (main heating system)	446.9204	313.1623	271.3212	171.7946	89.6916	0.0000	0.0000	0.0000	0.0000	146.7072	267.8104	401.4132	(211)
Water heating requirement	325.2610	288.0283	306.6137	270.6890	263.2337	238.0740	235.4315	244.1722	246.2129	273.5316	289.6647	321.8215	(64)
Water heating efficiency	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	(217)
Water heating fuel detail	185.2429	164.0381	174.6229	154.1630	149.9171	135.5881	134.0832	139.0612	140.2234	155.7820	164.9701	183.2841	(219)
Space cooling fuel total	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)
PV Generation in dwelling	150.1156	189.3944	271.4066	296.3129	291.8696	252.6940	242.8271	239.0020	220.9914	211.2531	156.2475	127.8479	(233a)
Wind Generation in dwelling	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)
Hydro Generation in dwelling	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)
micro-CHP in dwelling	-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)
PV Generation export	84.8024	156.4610	332.2739	546.7959	703.8369	819.7799	724.0961	661.1137	487.2572	259.4635	114.4473	66.5179	(233b)
Wind Generation export	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)
Hydro Generation export	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)

10. Fuel costs																		
Space heating - main system														2108.8210	21.5100	453.6074	(240)	
Water heating														1880.9760	21.5100	404.5979	(247)	
Electricity for lighting														363.5555	21.5100	78.2008	(250)	
Additional standing charges																0.0000	(251)	
Energy saving/generation technologies 1																-7606.8079	-847.0945	(252)
Total energy cost																	89.3116	(255)

12. Carbon dioxide emissions																	
Space heating - main system														2108.8210	0.1360	326.6940	(261)
Water heating														1880.9760	0.1360	264.8004	(264)
Space and water heating																591.4944	(265)
Energy for lighting														0.0000	0.1360	52.4723	(268)
Electricity generated - PVs														-7606.8079	1.6660	-977.1644	(269)
Electricity generated - wind														-0.0000	1.6660	-0.0000	(269)
Electricity generated - hydro														-0.0000	1.6660	-0.0000	(269)



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Electricity generated - mCHP	-0.0000	1.6660	-0.0000	(269)
Total kg\year			-333.1978	(272)

13. Primary energy				
Space heating - main system	2108.8210	18.1590	3318.2459	(275)
Water heating	1880.9760	18.1590	2860.1007	(278)
Space and water heating			6178.3466	(279)
Pumps and fans	0.0000	1.5133	0.0000	(281)
Energy for lighting	363.5555	1.5133	557.6336	(282)
Electricity generated - PVs	-7606.8079	18.1590	-6245.7517	(283)
Electricity generated - wind	-0.0000	18.1590	-0.0000	(283)
Electricity generated - hydro	-0.0000	18.1590	-0.0000	(283)
Electricity generated - mCHP	-0.0000	18.1590	-0.0000	(283)
Total kg\year			490.2285	(286)
EI value			101.3489	

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**Complete Energy Consultancy Ltd**

The Exchange  
 Brickrow  
 Stroud  
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Property	
UPRN	UPRN-000000000
Address	Little Tresevern; Tresevern;

1 Overall dwelling dimensions				
Ground floor	140.0000	2.3500	329.0000	(1b) – (3b)
First floor	146.0000	2.6500	386.9000	(1c) – (3c)
Total floor area			286.0000	(4)
Dwelling volume (m <sup>3</sup> )			715.9000	(5)

2 Ventilation rate														
Number of chimneys														0 (6a)
Number of open flues														0 (6b)
Number of chimneys/flues to closed fires														0 (6c)
Number of flues to solid fuel boilers														0 (6d)
Number of flues attached to other heaters														0 (6d)
Number of blocked chimneys														0 (6f)
Number of intermittent fans														70 (7a)
Number of passive vents														0 (7b)
Number of flueless gas fires														0 (7c)
Infiltration due to chimneys, flues and fans														0.0978 (8)
Predicted Design q50(assumed)														3.0000 (17)
Infiltration rate														0.2478 (18)
Number of sides sheltered														2 (19)
Shelter factor														0.8500 (20)
Infiltration rate incorporating shelter factor														0.2106 (21)
	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>		
Wind speed	5.8000	5.5000	5.5000	5.0000	4.9000	4.3000	4.3000	4.1000	4.5000	5.1000	5.1000	5.7000	(22)	
Wind factor	1.4500	1.3750	1.3750	1.2500	1.2250	1.0750	1.0750	1.0250	1.1250	1.2750	1.2750	1.4250	(22a)	
Adj infilt rate	0.3054	0.2896	0.2896	0.2633	0.2580	0.2264	0.2264	0.2159	0.2369	0.2685	0.2685	0.3001	(22b)	
Effective ach	0.5466	0.5419	0.5419	0.5347	0.5333	0.5256	0.5256	0.5233	0.5281	0.5361	0.5361	0.5450	(25)	

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3. Heat losses and heat loss parameter												
Windows (1)									54.8500	0.9615	52.7404	(27)
groundFloor								140.0000	0.1000	14.0000	75.0000	10500.0000 (28a)
exposeWall								92.0300	0.1800	34.5654	9.0000	1728.2700 (29a)
exposeWall								.1200	0.1800	1.1016	9.0000	55.0800 (29a)
exposeWall								9.0000	0.1800	3.4200	9.0000	171.0000 (29a)
exposedRoof								105.0000	0.1000	10.5000	9.0000	945.0000 (30)
exposedRoof								77.0000	0.1500	11.5500	9.0000	693.0000 (30)
exposedRoof								5.0000	0.1000	0.5000	9.0000	45.0000 (30)
Total area of external elements:												599.0000 (31)
Fabric heat loss:												128.3774 (33)
Heat capacity:												14137.3500 (34)
Thermal mass parameter:												100.0000 (35)
Thermal bridges:												18.1160 (36)
Total fabric heat loss :												146.4934 (37)
		<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>
Vent loss	129.1399	128.0297	128.0297	126.3105	125.9863	124.1786	124.1786	123.6284	124.7549	126.6412	126.6412	128.7633 (38)
Heat transfer coeff	275.6333	274.5231	274.5231	272.8039	272.4797	270.6720	270.6720	270.1218	271.2483	273.1346	273.1346	275.2567 (39)
Heat transfer coeff (average)												272.8502 (39)
HLP	0.9638	0.9599	0.9599	0.9539	0.9527	0.9464	0.9464	0.9445	0.9484	0.9550	0.9550	0.9624 (40)
HLP (average)												0.9540 (40)
Days in month	31.0000	28.0000	31.0000	30.0000	31.0000	30.0000	31.0000	31.0000	30.0000	31.0000	30.0000	31.0000 (41)
heat pump calculation Output power												9040.0000
Design heat loss												6602.9760
Plant size ratio												1.3691
Service provision							space	and	water	heating	all	year
DHW vessel											separate	specified
Heating duration												variable
Secondary fraction												0.0000
Space heating thermal efficiency												377.0599
Summer thermal efficiency												175.5862

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Net space heating specific electricity generated	0.0000
Net water heating specific electricity generated	0.0000
Net annual electricity generated	0.0000
Heat losses and heat loss parameter	complete

4. Water heating energy requirements												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												3.1137 (42)
Average daily hot water use (litres/day)												143.3381 (43)
Mixer shower usage	76.4269	75.2784	73.6047	70.4025	68.0393	65.4039	63.9059	65.5669	67.3877	70.2173	73.4883	76.1341 (42a)
Bath usage	32.9893	32.4994	31.8094	30.5373	29.5848	28.5285	27.9580	28.6431	29.3891	30.5193	31.8176	32.8778 (42b)
Other usage	46.5177	44.8262	43.1346	41.4430	39.7515	38.0599	38.0599	39.7515	41.4430	43.1346	44.8262	46.5177 (42c)
Daily hot water use	155.9339	152.6039	148.5487	142.3828	137.3755	131.9924	129.9239	133.9615	138.2198	143.8712	150.1321	155.5296 (44)
Energy content	246.9612	217.3059	228.3139	194.9150	184.9339	162.3000	157.1317	165.8724	170.4389	195.2318	213.8907	243.5217 (45)
Energy content(annual)												2380.8169 (45)
Distribution loss	37.0442	32.5959	34.2471	29.2372	27.7401	24.3450	23.5698	24.8809	25.5658	29.2848	32.0836	36.5283 (46)
Cylinder volume												110.0000 (47)
Measured cylinder loss (kWh/day)												2.0900 (48)
Temperature factor												0.5400 (49)
Energy lost from water storage (kWh/day)												1.1286 (50)
Energy lost from cylinder in kWh/day												1.1286 (55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866 (56)
Net storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866 (57)
Primary loss factor	1.0000	1.0000	0.9400	0.7000	0.4500	0.4400	0.4400	0.4800	0.7600	0.9400	1.0000	1.0000
Primary loss	43.3132	39.1216	40.7144	29.3412	19.4909	18.4430	19.0578	20.7903	31.8562	40.7144	41.9160	43.3132 (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	325.2610	288.0283	304.0149	258.1142	239.4114	214.6011	211.1761	221.6493	236.1530	270.9328	289.6647	321.8215 (62)
WWHRS Saving	-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 Saving	-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	-6.9771	-25.6548	-72.9409	-98.8290	-118.8971	-120.7208	-108.6258	-103.8199	-77.0953	-44.5383	-10.5164	-0.0000 (63c)
FGHRS Saving	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)
WW heat rec.	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63)

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Flue gas heat rec.	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	(G6)
Fghrs PV	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	
Output from w/h	318.2839	262.3734	231.0740	159.2852	120.5143	93.8803	102.5503	117.8294	159.0578	226.3945	279.1483	321.8215		(64)
Output from water heater(annual)													2392.2130	(64)
Instantaneous electric showers	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	(64a)
Heat gains (kWh)	144.7544	128.8321	136.4752	115.3686	105.0725	95.8056	95.4818	99.7741	109.2422	125.4754	131.7378	143.6108		(65)

**5. Internal gains**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Metabolic	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	186.8238	(66)
Lighting	51.4650	45.7108	37.1745	28.1435	21.0376	17.7608	19.1912	24.9454	33.4817	42.5127	49.6186	52.8954		(67)
Appliances	666.9054	673.8258	656.3867	619.2608	572.3960	528.3496	498.9240	492.0036	509.4428	546.5687	593.4335	637.4798		(68)
Cooking	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	56.7961	(69)
Pumps, fans	10.0000	10.0000	10.0000	10.0000	10.0000	0.0000	0.0000	0.0000	0.0000	10.0000	10.0000	10.0000		(70)
Losses	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	-124.5492	(71)
Water heating	194.5624	191.7145	183.4344	160.2341	141.2265	133.0633	128.3358	134.1050	151.7253	168.6497	182.9692	193.0253		(72)
Total internal	1042.0036	1040.3218	1006.0663	936.7091	863.7308	798.2445	765.5217	770.1248	813.7206	886.8019	955.0921	1012.4712		(73)

**6. Solar gains**

Windows (1)										54.8500	0.9615	52.7404		(27)
groundFloor							140.0000	0.1000	14.0000	75.0000	10500.0000			(28a)
exposeWall							92.0300	0.1800	34.5654	9.0000	1728.2700			(29a)
exposeWall							.1200	0.1800	1.1016	9.0000	55.0800			(29a)
exposeWall							9.0000	0.1800	3.4200	9.0000	171.0000			(29a)
exposedRoof							105.0000	0.1000	10.5000	9.0000	945.0000			(30)
exposedRoof							77.0000	0.1500	11.5500	9.0000	693.0000			(30)
exposedRoof							5.0000	0.1000	0.5000	9.0000	45.0000			(30)
Total area of external elements:												599.0000		(31)
Fabric heat loss:												128.3774		(33)
Heat capacity:												14137.3500		(34)
Thermal mass parameter:												100.0000		(35)
Thermal bridges:												18.1160		(36)

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Total fabric heat loss :													146.4934	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Solar gains	382.3157	607.0858	949.2041	1404.8797	1661.8294	1882.7678	1629.8949	1471.9541	1158.3478	741.0181	451.0709	319.5906	(83)	
Total gains	1424.3193	1647.4076	1955.2704	2341.5888	2525.5602	2681.0123	2395.4166	2242.0789	1972.0684	1627.8200	1406.1630	1332.0618	(84)	

7. Mean internal temperature														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Living room temperature during heating periods Th1													21.0000	(85)
Heating system responsiveness													0.7500	
tau			28.8225	28.9391	28.9391	29.1215	29.1561	29.3508	29.3508	29.4106	29.2885	29.0862	29.0862	28.8620
alpha			2.9215	2.9293	2.9293	2.9414	2.9437	2.9567	2.9567	2.9607	2.9526	2.9391	2.9391	2.9241
external Temp			6.3000	6.6000	7.6000	9.1000	11.6000	14.3000	16.0000	16.0000	14.3000	11.8000	9.0000	6.7000
util living area			0.9689	0.9536	0.9197	0.8528	0.7517	0.5889	0.5142	0.5407	0.7157	0.8800	0.9508	0.9718 (86)
MIT 1			20.1649	19.5315	19.8188	20.1787	20.5152	20.7612	20.8263	20.8167	20.6627	20.2760	19.7826	19.6102 (87)
th2			20.1136	20.1169	20.1169	20.1220	20.1229	20.1282	20.1282	20.1299	20.1265	20.1210	20.1210	20.1148 (88)
util rest			0.9638	0.9463	0.9072	0.8308	0.7143	0.5309	0.4390	0.4638	0.6595	0.8545	0.9413	0.9670 (89)
MIT 2			19.3479	18.4018	18.7614	19.2066	19.6074	19.8811	19.9465	19.9409	19.7866	19.3381	18.7257	18.5577 (90)
Living area fraction =													0.1563	(91)
MIT			19.4756	18.5783	18.9267	19.3586	19.7493	20.0187	20.0840	20.0777	19.9235	19.4847	18.8909	18.7222 (92)
Temperature adjustment													0.0000	
adjusted MIT			19.4756	18.5783	18.9267	19.3586	19.7493	20.0187	20.0840	20.0777	19.9235	19.4847	18.8909	18.7222 (93)

8. Space heated requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9595	0.9294	0.8863	0.8085	0.6966	0.5231	0.4350	0.4589	0.6448	0.8319	0.9238	0.9570	(94)
Useful gains W	1366.6432	1531.1703	1732.8613	1893.1946	1759.2955	1402.3959	1041.9473	1028.8097	1271.5538	1354.1957	1299.0428	1274.8324	(95)
Ext temp.	6.3000	6.6000	7.6000	9.1000	11.6000	14.3000	16.0000	16.0000	14.3000	11.8000	9.0000	6.7000	(96)
Heat loss rate W	3631.6397	3288.3270	3109.4274	2798.5800	2220.5164	1547.8818	1105.4165	1101.4872	1525.3736	2098.9542	2701.5503	3309.1982	(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating requirement for	1685.1573	1180.8093	1024.1652	651.8775	343.1484	0.0000	0.0000	0.0000	0.0000	554.1003	1009.8054	1513.5682	(98a)
Solar space heating contribution	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)
Total space heating requirement	1685.1573	1180.8093	1024.1652	651.8775	343.1484	0.0000	0.0000	0.0000	0.0000	554.1003	1009.8054	1513.5682	(98)

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Space heating per m2													27.8414	(99)
Utilisation	0.9595	0.9294	0.8863	0.8085	0.6966	0.5231	0.4350	0.4589	0.6448	0.8319	0.9238	0.9570		(94)
Useful gains W	1366.6432	1531.1703	1732.8613	1893.1946	1759.2955	1402.3959	1041.9473	1028.8097	1271.5538	1354.1957	1299.0428	1274.8324		(95)
Ext temp.	6.3000	6.6000	7.6000	9.1000	11.6000	14.3000	16.0000	16.0000	14.3000	11.8000	9.0000	6.7000		(96)
Heat loss rate W	3631.6397	3288.3270	3109.4274	2798.5800	2220.5164	1547.8818	1105.4165	1101.4872	1525.3736	2098.9542	2701.5503	3309.1982		(97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000		(97a)
Space heating requirement for each month (kWh)	1685.1573	1180.8093	1024.1652	651.8775	343.1484	0.0000	0.0000	0.0000	0.0000	554.1003	1009.8054	1513.5682		(98a)
Solar space heating contribution (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)
Total space heating requirement (kWh/month)	1685.1573	1180.8093	1024.1652	651.8775	343.1484	0.0000	0.0000	0.0000	0.0000	554.1003	1009.8054	1513.5682		(98)
Space heating per m2													27.8414	(99)

<b>9. Energy requirements</b>															
Fraction of space heat from secondary														0.0000	(201)
Fraction of space heat from main system														1.0000	(202)
Fraction of total space heat from main system 1														1.0000	(204)
Efficiency of main heating system 1														377.0599	(206)
Efficiency of secondary heating system														100.0000	(208)
Efficiency of water heater														175.5862	(216)
micro-CHP export														0.0000	(235d)
Space heating fuel - main system 1														2111.7685	(211)
Water heating fuel														1362.4153	(219)
pump for solar water heating														80.0000	(230g)
Electricity for pumps and fans														80.0000	(231)
Electricity for lighting														363.5555	(232)
PV generation														-7606.8079	(233)

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Wind generation														-3575.5408	(234)
Micro-CHP generation														0.0000	(235)
Total delivered energy for all uses														-7264.6093	(238)
		<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>		
Space heating efficiency (main heating system)	377.0599	377.0599	377.0599	377.0599	377.0599	377.0599	0.0000	0.0000	0.0000	0.0000	377.0599	377.0599	377.0599		(210)
Space heating fuel (main heating system)	446.9204	313.1623	271.6187	172.8843	91.0063	0.0000	0.0000	0.0000	0.0000	146.9529	267.8104	401.4132			(211)
Water heating requirement	318.2839	262.3734	231.0740	159.2852	120.5143	93.8803	102.5503	117.8294	159.0578	226.3945	279.1483	321.8215			(64)
Water heating efficiency	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862	175.5862		(217)
Water heating fuel detail	181.2693	149.4272	131.6015	90.7162	68.6354	53.4668	58.4046	67.1063	90.5867	128.9364	158.9808	183.2841			(219)
Space cooling fuel total	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		(221)
PV Generation in dwelling	150.1967	188.8896	267.2832	285.0874	271.8945	225.5876	219.8184	218.6589	210.3868	208.9829	156.2755	128.0126			(233a)
Wind Generation in dwelling	212.5732	192.0016	212.5732	205.7160	212.5732	205.7160	212.5732	212.5732	205.7160	212.5732	205.7160	212.5732			(234a)
Hydro Generation in dwelling	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		(235a)
micro-CHP in dwelling	-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		(235c)
PV Generation export	84.7212	156.9658	336.3973	558.0214	723.8120	846.8863	747.1049	681.4569	497.8618	261.7337	114.4194	66.3532			(233b)
Wind Generation export	91.1028	82.2864	91.1028	88.1640	91.1028	88.1640	91.1028	91.1028	88.1640	91.1028	88.1640	91.1028			(234b)
Hydro Generation export	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		(235b)

<b>10. Fuel costs</b>																			
Space heating - main system														2111.7685	21.5100	454.2414	(240)		
Water heating														1362.4153	21.5100	293.0555	(247)		
Pumps and fans for heating 1														80.0000	21.5100	17.2080	(249)		
Electricity for lighting														363.5555	21.5100	78.2008	(250)		
Additional standing charges																0.0000	(251)		
Energy saving\generation technologies 1																-7606.8079	-828.1676	(252)	
Energy saving\generation technologies 2																-3575.5408	21.5100	-769.0988	(252)
Total energy cost																	-754.5606	(255)	

<b>12. Carbon dioxide emissions</b>																	
Space heating - main system														2111.7685	0.1360	327.1023	(261)
Water heating														1362.4153	0.1360	198.5057	(264)



**SAP 10 WORKSHEET (Version 10.2, December 2021)  
 CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY  
 ENERGY FOR IMPROVED DWELLING**

Date 25/10/2023



**Complete Energy Consultancy Ltd**

The Exchange  
 Brickrow  
 Stroud  
 Tel: 07771 964593

Space and water heating				525.6080	(265)
Pumps and fans	80.0000	0.1388	11.0970		(267)
Energy for lighting	0.0000	0.1360	52.4723		(268)
Electricity generated - PVs	-7606.8079	1.6660	-975.9880		(269)
Electricity generated - wind	-3575.5408	1.6660	-495.9716		(269)
Electricity generated - hydro	-0.0000	1.6660	-0.0000		(269)
Electricity generated - mCHP	-0.0000	1.6660	-0.0000		(269)
Total kg/year				-882.7823	(272)

13. Primary energy					
Space heating - main system	2111.7685	18.1590	3322.7041		(275)
Water heating	1362.4153	18.1590	2096.7164		(278)
Space and water heating			5419.4204		(279)
Pumps and fans	80.0000	1.5133	121.0240		(281)
Energy for lighting	363.5555	1.5133	557.6336		(282)
Electricity generated - PVs	-7606.8079	18.1590	-6122.1765		(283)
Electricity generated - wind	-3575.5408	18.1590	-4336.4158		(283)
Electricity generated - hydro	-0.0000	18.1590	-0.0000		(283)
Electricity generated - mCHP	-0.0000	18.1590	-0.0000		(283)
Total kg/year				-4360.5143	(286)
EI value				103.5738	