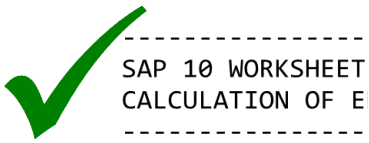
GMCA SAP Conversion Tool V2.3

This page provides guidance on where to g

GMCA GREATER MANCHESTER COMBINED AUTHORITY

This page provides guidance notes on h
methodology report, available from Gre

CAUTION! All values should be taken fr
Energy Rating, Fabric Energy Efficienc



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Climate Zone

Climate Zone

Inputs - General

Quantity

Plot name
Bedrooms
Number of storeys
SAP Floor Area
Volume
Site exposure

Inputs - Space Heating Demand

Air Permeability
Total Area External Elements
Total Area Party Elements
Ventilation System
Heat Recovery %
Thermal Mass
Fabric Heat Loss
Solar Gains

Inputs - Total Energy Use

Space Heat Source - Primary
Heating Efficiency - Primary
Space Heat Source - Secondary
Heating Efficiency - Secondary
Fraction of Heat - Secondary
Domestic Hot Water Source
Water Heating Efficiency
Hot Water Storage Losses
Pumps and Fans Energy
Lighting Efficacy

Inputs - Renewables
Renewable Generation

Water Heating Reductions
Water Heating Reductions

get the information required to use this tool, and explains the different inputs that are required.

how to use this tool. For a more comprehensive description of why it was developed and how it works, please see the supporting
eater Manchester Combined Authority.

rom SAP EPC Cost worksheet for as built dwelling only, see example below. Do not use values for improved dwellings, or values from
cy, Dwelling Emission Rate, or Target Emission Rate,worksheets.

FOR New Build (As Built) (Version 10.2, February 2022)

PC COSTS, EMISSIONS AND PRIMARY ENERGY

FOR New Build (As Built) (Version 10.2, February 2022)
EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

FOR New Build (As Built) (Version 10.2, February 2022)
ENERGY RATING

FOR New Build (As Built) (Version 10.2, February 2022)
ENERGY RATING FOR IMPROVED DWELLING

FOR New Build (As Built) (Version 10.2, February 2022)
FABRIC ENERGY EFFICIENCY

FOR New Build (As Built) (Version 10.2, February 2022)
TARGET FABRIC ENERGY EFFICIENCY

FOR New Build (As Built) (Version 10.2, February 2022)
DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

FOR New Build (As Built) (Version 10.2, February 2022)
TARGET EMISSIONS

Select the climate zone for the development, this should be the same as the SAP climate zone.

If there are identical dwellings, enter the number here. This value is used to multiply any renewable energy deficit that may exist. Identical dwellings are considered to be homes that are the same type, shape, size, specification, orientation and have the same renewable provision. Mirrored houses are not considered identical.

Use a new row for each plot, and enter a name that can be linked to the SAP calculation printout

The number of bedrooms is required to calculate the Part F ventilation rate

Enter the dwelling's internal floor area entered into SAP

Enter the dwelling volume calculated by SAP

Select 'Normal' for most cases. 'Extreme Exposure' should be used for buildings in open areas, or tall buildings in urban areas. 'Extreme Shelter' should only be used for low rise buildings in city centres or forests.

Enter the design air permeability used in SAP here. This value can be changed to test the impact of different levels of airtightness on the building's energy consumption

Enter the total area of external elements from SAP here.

Enter the total area of party floors, walls and ceilings from SAP here. Internal partitions within a dwelling should not be included.

Select the appropriate ventilation system type, usually MVHR is required to achieve the policy requirements.

Enter the heat recovery system efficiency calculated by SAP here. For non-MVHR systems, enter zero.

This single figure from SAP captures the transmission losses of the building fabric due to floors, walls, roofs, windows, doors, and thermal bridges.

Enter the solar gains for each month calculated by SAP here.

Select the type of primary space heating source from the drop down list

Enter the efficiency of the primary space heating source assumed in SAP

Where present, select the type of secondary space heating source from the drop down list

Where present, enter the efficiency of the secondary space heating source assumed in SAP

Where present, enter the proportion of heat provided by the secondary space heating source assumed in SAP

Select the type of water heating source from the drop down list

Enter the efficiency of the water heating source assumed in SAP

Enter the daily losses for any hot water stores assumed in SAP

Enter the electricity use for pumps and fans calculated by SAP

Enter the average lighting efficacy for the whole dwelling in lumens per Watt.

Enter the renewable energy generation reported by SAP here as a negative number. To ensure the correct renewable energy generation figure is obtained, the 'MCS certified' box in SAP should be checked, and if the dwelling has a Solar PV Diverter, this should be

If the dwelling has wastewater heat recovery, solar water heating, or flue gas heat recovery, enter the reduction to hot water demand for each month here. Solar PV diverters should be disabled when generating SAP calculation results for use in this tool.

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s page provides the terms of use for this tool.

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GMCA SAP Conversion Tool V2.3

This is the main input page where the user inputs SAP 10.3 results and the tool shows the

SAP Conversion Tool V2.3

Climate Zone: 7 West Pennines Wales / West Pennines England

Results				
Space heat demand	Total energy use	Renewable generation	Renewable deficit	Quantity
kWh/m^2_{TFA}.yr	kWh/m^2_{GIA}.yr	% total energy	kWh/year	
Best practice values:				
<15	<35	100%	0	
19.9	30.7	110%	0	1
160.4	171.2	7%	15661	1
130.8	151.6	11%	6984	1
94.3	118.2	11%	5537	1
141.7	153.4	5%	14246	1

		Total:	42428

recalculated results for use with GMCA planning applications.

Inputs - general				
Plot Name	Bedrooms	Number of storeys	SAP Floor Area	Volume
			m2	m3
		Box numbers from SAP calculation printout --->	[4]	[5]
Example - Semi Detached House	3	2	93.2	235
Plot 3	1	2	98	318
Plot 4	1	2	51.9	139
Plot 6	1	2	52.48	155
Plot 9	1	2	98.14	163

*excluding internal partition elements

Site Exposure	Air permeability @50Pa	Total area external elements	Total area party elements*	Ventilation system
	m3/m2.hr	m2	m2	
	[17]	[31]	[32]+[32a]+[32b]	
Normal	0.6	193	39	MVHR
Normal	8	268	96	MVHR
Normal	8	126	83	MVHR
Normal	8	80	99	MVHR
Normal	8	254	102	MVHR

Inputs - Space Heating Demand							
Heat recovery	Thermal mass	Fabric heat loss					
%	kJ/m2.K	W/K					
[23c]	[35]	[37]					
			Jan	Feb	Mar	Apr	May
79%	124	40.8	53	98	152	214	249
0%							
72%	245	142.4	82	160	263	384	470
72%	181	72.3	153	261	357	442	495
72%	174	56.4	153	260	357	442	494
72%	219	129.7	153	260	356	441	494
0%							
0%							
0%							
0%							
0%							
0%							
0%							
0%							
0%							
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0%							
0%							

0%							
0%							
0%							

Solar gains
W
[83]

Jun	Jul	Aug	Sep	Oct	Nov	Dec
260	242	207	176	119	68	48
481	458	394	306	190	102	67
491	474	434	386	288	183	131
491	474	434	386	288	183	130
491	474	434	386	288	183	130

Inputs			
Space heat source	Heating efficiency	Space heat source	Heating efficiency
(Primary)		(Secondary)	
	[206]		[207]
Heat pump - air to water	309%		
Direct electric	100%		
Direct electric	100%		
Direct electric	100%		
Direct electric	100%		

- Total Energy Use

Fraction of heat	Domestic hot water source	Water heating efficiency	Hot water storage losses	Pumps and fans energy
			kWh/day	kWh/year
[201]		[216]	[48]	[231]
	Heat pump - air to water	189%	1.4	189
	Heat pump - air to water	267%	1.6	359
	Heat pump - air to water	267%	1.6	156
	Heat pump - air to water	267%	1.6	174
	Heat pump - air to water	267%	1.6	296

	Inputs - Renewables	Water Heat				
Lighting Efficacy	Renewable Generation	Inputs only required for: waste wate				
Lumen/Watt	kWh/year					
	[233]					
		Jan	Feb	Mar	Apr	May
120	-2923					
124	-1042					
124	-826					
124	-622					
124	-751					

ing Reductions - where applicable
r heat recovery, solar hot water and flue gas heat recovery
kWh
Sum of [63 a, c and d]

Jun	Jul	Aug	Sep	Oct	Nov	Dec

	SAP Conversion	
	Asymptote of sigmoid	Width of sigmoid
Example - Semi Detached House	1.76	-0.000349
Plot 3	1.76	-0.000349
Plot 4	1.76	-0.000349
Plot 6	1.76	-0.000349
Plot 9	1.76	-0.000349

n Tool V2		
Linear component	Offset	Occupancy
0.0013	13.9	2.67
0.0013	13.9	2.72
0.0013	13.9	1.75
0.0013	13.9	1.76
0.0013	13.9	2.72

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	Flow Rate @50Pa	Estimate Vv	Estimate Vn50	ACH @50Pa
	m^3/h	m^3	m^3	ACH
Example - Semi Detached House	139	214	204	0.68
Plot 3	2,912	225	279	10.44
Plot 4	1,672	119	121	13.85
Plot 6	1,432	121	135	10.58
Plot 9	2,848	226	136	20.88

Infiltration Rate	Adjusted infiltration for wind								
ACH	ACH								
	[22b]								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04
0.90	0.96	0.94	0.92	0.84	0.82	0.74	0.74	0.74	0.74
0.98	1.05	1.02	1.00	0.92	0.89	0.81	0.81	0.81	0.81
0.83	0.89	0.87	0.85	0.78	0.76	0.68	0.68	0.68	0.68
0.88	0.94	0.92	0.90	0.82	0.80	0.73	0.73	0.73	0.73

			Ventilation rate per mon						
			ACH						
			Part F Minimum Ventilation						
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
0.04	0.04	0.05	0.11	0.11	0.11	0.11	0.11	0.11	0.11
0.84	0.86	0.90	0.13	0.13	0.13	0.13	0.13	0.13	0.13
0.92	0.94	0.98	0.16	0.16	0.16	0.16	0.16	0.16	0.16
0.78	0.79	0.83	0.16	0.16	0.16	0.16	0.16	0.16	0.16
0.82	0.84	0.88	0.13	0.13	0.13	0.13	0.13	0.13	0.13

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nth					Effective air change ra				
Rate									
Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
0.11	0.11	0.11	0.11	0.11	0.16	0.16	0.15	0.15	0.15
0.13	0.13	0.13	0.13	0.13	1.10	1.08	1.06	0.98	0.96
0.16	0.16	0.16	0.16	0.16	1.21	1.18	1.16	1.08	1.05
0.16	0.16	0.16	0.16	0.16	1.04	1.03	1.01	0.93	0.92
0.13	0.13	0.13	0.13	0.13	1.07	1.05	1.03	0.96	0.94

ate (combined ventilation and infiltration)									
ACH									
[25]									
Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
0.15	0.15	0.15	0.15	0.15	0.15	0.15	11	11	11
0.88	0.88	0.88	0.88	0.98	1.00	1.04	82	80	79
0.97	0.97	0.97	0.97	1.08	1.10	1.14	48	47	46
0.84	0.84	0.84	0.84	0.93	0.95	0.99	42	41	40
0.86	0.86	0.86	0.86	0.96	0.98	1.01	80	79	77

Ventilation and infiltration heat loss coefficient

W/K

[38]

Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
11	11	10	10	10	10	11	11	11
73	71	65	65	65	65	73	74	77
42	42	38	38	38	38	42	43	45
37	36	34	34	34	34	37	38	39
71	70	64	64	64	64	71	73	76

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	kWh/year	kWh/year	kWh/year	kWh/year
	Refrigeration	Dishwashing	Clothes Washing	Clothes Drying
Example - Semi Detached House	223	159	120	324
Plot 3	223	163	122	330
Plot 4	223	104	79	212
Plot 6	223	105	79	214
Plot 9	223	163	123	330

			Energy Use				
kWh/year	kWh/year	kWh/year					
Small Devices per Dwelling	Small Devices per Occupant	Total					
			Jan	Feb	Mar	Apr	May
150	200	1176	114	104	112	103	98
150	204	1192	116	106	114	104	99
150	131	899	87	80	86	78	75
150	132	904	88	80	86	79	75
150	204	1193	116	106	114	104	99

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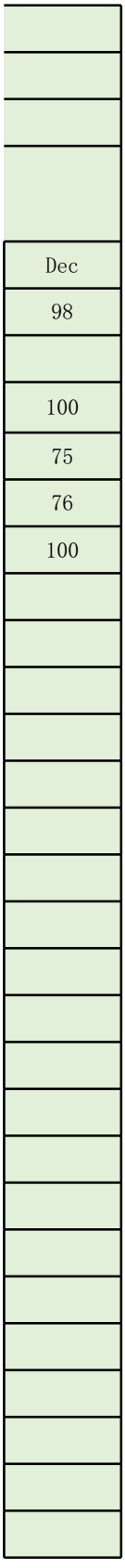
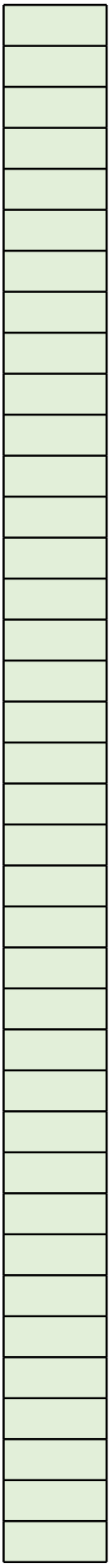
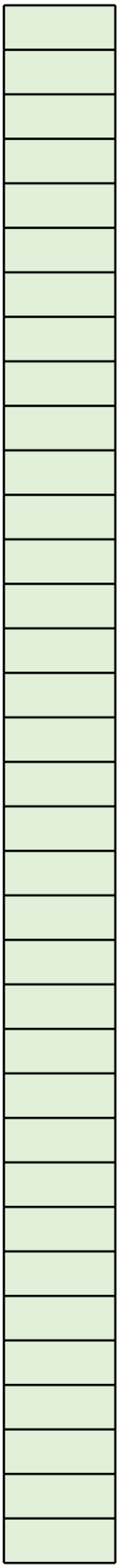
kWh							kWh/year	
[L14]							[L15]	
Jun	Jul	Aug	Sep	Oct	Nov	Dec		Jan
88	85	84	84	94	98	109	1175	103
89	87	85	86	95	100	111	1191	104
67	65	64	65	72	75	83	898	79
67	66	65	65	72	76	84	903	79
89	87	85	86	95	100	111	1191	104

Heat gains									
Watts									
[L16a] or [68]									
Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
104	101	96	88	82	77	76	79	84	92
105	103	97	90	83	78	77	80	85	93
79	77	73	67	62	59	58	60	64	70
80	78	73	68	63	59	58	60	65	70
105	103	97	90	83	78	77	80	86	93


Dec
98
100
75
76
100





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	kWh/year				
	[L20]				
		Jan	Feb	Mar	Apr
Example - Semi Detached House	213	18	16	18	17
Plot 3	214	18	16	18	18
Plot 4	187	16	14	16	15
Plot 6	187	16	14	16	15
Plot 9	214	18	16	18	18

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Energy Use									
kWh									
[L21]									
May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
18	17	18	18	17	18	17	18	18	18
18	18	18	18	18	18	18	18	18	18
16	15	16	16	15	16	15	16	16	16
16	15	16	16	15	16	15	16	16	16
18	18	18	18	18	18	18	18	18	18

Heat gains
Watts
[69]

Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
18	18	18	18	18	18	18	18	18	18
18	18	18	18	18	18	18	18	18	18
16	16	16	16	16	16	16	16	16	16
16	16	16	16	16	16	16	16	16	16
18	18	18	18	18	18	18	18	18	18

Etude

		Energy use					
	kWh/year	kW					
		Jan	Feb	Mar	Apr	May	Jun
Example - Semi Detached House	107	13	11	10	7	5	4
Plot 3	105	13	10	9	7	5	4
Plot 4	68	8	7	6	4	3	3
Plot 6	68	8	7	6	4	3	3
Plot 9	105	13	10	9	7	5	4

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Wh

Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
5	6	8	11	12	14	15	13	11	8
5	6	8	11	12	13	15	13	11	8
3	4	5	7	8	9	10	8	7	5
3	4	5	7	8	9	10	9	7	5
5	6	8	11	12	13	15	13	11	8

Heat gains

Watts

May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6	5	6	7	10	12	15	15
6	5	6	7	10	12	14	15
4	3	4	5	6	8	9	10
4	3	4	5	6	8	9	10
6	5	6	7	10	12	14	15

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	Daily hot wa					
	litre					
	Jan	Feb	Mar	Apr	May	Jun
Example - Semi Detached House	73	71	68	65	63	60
Plot 3	75	72	69	67	64	61
Plot 4	48	46	45	43	41	39
Plot 6	48	47	45	43	41	40
Plot 9	75	72	69	67	64	61

ater demand									
s/day									
Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
60	63	65	68	71	73	137	119	124	108
61	64	67	69	72	75	140	121	127	110
39	41	43	45	46	48	90	78	81	70
40	41	43	45	47	48	91	79	82	71
61	64	67	69	72	75	140	121	127	110

Energy content of hot water									
kWh									
May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sum	Jan
102	91	90	96	99	112	120	136	1334	21
104	92	92	98	101	114	123	139	1360	21
67	59	59	63	65	73	79	89	873	13
68	60	59	63	65	74	80	90	882	14
105	92	92	98	101	114	123	139	1361	21

Distribution losses

kWh

Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
18	19	16	15	14	13	14	15	17	18
18	19	16	16	14	14	15	15	17	18
12	12	11	10	9	9	9	10	11	12
12	12	11	10	9	9	9	10	11	12
18	19	16	16	14	14	15	15	17	18

	Storage loss								
	kWh								
Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
20	26	24	26	25	26	25	26	26	25
21	30	27	30	29	30	29	30	30	29
13	30	27	30	29	30	29	30	30	29
13	30	27	30	29	30	29	30	30	29
21	30	27	30	29	30	29	30	30	29

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			Primary circuit loss						
			kWh						
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
26	25	26	23	21	23	23	23	23	23
30	29	30	0	0	0	0	0	0	0
30	29	30	0	0	0	0	0	0	0
30	29	30	0	0	0	0	0	0	0
30	29	30	0	0	0	0	0	0	0

Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
23	23	23	23	23	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

Combi losses									
kWh									
Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
0	0	0	0	0	0	0	207	181	192
0	0	0	0	0	0	0	191	166	175
0	0	0	0	0	0	0	133	116	123
0	0	0	0	0	0	0	134	117	124
0	0	0	0	0	0	0	191	167	175

Total heat for water heating									
kWh									
Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
172	167	152	153	159	161	178	186	206	207
155	150	135	135	142	145	161	170	189	191
110	107	97	97	102	103	114	119	132	133
111	108	98	98	102	104	115	120	133	134
155	150	135	135	142	145	161	170	189	191

Water heating demand / Output from water heater

kWh

Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
181	192	172	167	152	153	159	161	178	186
166	175	155	150	135	135	142	145	161	170
116	123	110	107	97	97	102	103	114	119
117	124	111	108	98	98	102	104	115	120
167	175	155	150	135	135	142	145	161	170

	Heat gains from water heating								
	kWh								
Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
206	82	72	77	71	70	65	66	68	68
189	68	60	63	57	56	52	52	54	54
132	52	45	49	45	44	41	41	43	43
133	52	46	49	45	44	41	42	43	43
189	68	60	63	57	56	52	52	54	54

Oct	Nov	Dec
73	75	81
59	62	67
46	47	51
46	47	52
59	62	67

Etude

					Metab	
					Wat	
					[6	
	Jan	Feb	Mar	Apr	May	Jun
Example - Semi Detached House	117	117	117	117	117	117
Plot 3	120	120	120	120	120	120
Plot 4	77	77	77	77	77	77
Plot 6	78	78	78	78	78	78
Plot 9	120	120	120	120	120	120

polic

tts

6]

Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
117	117	117	117	117	117	15	13	11	8
120	120	120	120	120	120	15	13	11	8
77	77	77	77	77	77	10	8	7	5
78	78	78	78	78	78	10	9	7	5
120	120	120	120	120	120	15	13	11	8

Lighting									
Watts									
[67]									
May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
6	5	6	7	10	12	15	15	103	104
6	5	6	7	10	12	14	15	104	105
4	3	4	5	6	8	9	10	79	79
4	3	4	5	6	8	9	10	79	80
6	5	6	7	10	12	14	15	104	105

Appliances									
Watts									
[68]									
Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
101	96	88	82	77	76	79	84	92	98
103	97	90	83	78	77	80	85	93	100
77	73	67	62	59	58	60	64	70	75
78	73	68	63	59	58	60	65	70	76
103	97	90	83	78	77	80	86	93	100

Cooking									
Watts									
[69]									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
18	18	18	18	18	18	18	18	18	18
18	18	18	18	18	18	18	18	18	18
16	16	16	16	16	16	16	16	16	16
16	16	16	16	16	16	16	16	16	16
18	18	18	18	18	18	18	18	18	18

SAP Conversion Tool V2									
		Pumps and fans							
		Watts							
		[70]							
Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
18	18	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
18	18	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
16	16	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
16	16	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
18	18	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

				Evaporati					
				Wat					
				[7					
Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1.3	1.3	1.3	1.3	-107	-107	-107	-107	-107	-107
2.5	2.5	2.5	2.5	-109	-109	-109	-109	-109	-109
1.1	1.1	1.1	1.1	-70	-70	-70	-70	-70	-70
1.2	1.2	1.2	1.2	-71	-71	-71	-71	-71	-71
2.0	2.0	2.0	2.0	-109	-109	-109	-109	-109	-109

ve losses									
tts									
1]									
Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
-107	-107	-107	-107	-107	-107	110	107	104	98
-109	-109	-109	-109	-109	-109	91	89	85	80
-70	-70	-70	-70	-70	-70	69	68	65	62
-71	-71	-71	-71	-71	-71	70	68	66	62
-109	-109	-109	-109	-109	-109	91	89	85	80

Water heating									
Watts									
[72]									
May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
94	91	89	91	94	99	104	109	258	255
76	72	70	73	75	80	85	91	242	239
59	57	56	57	59	62	66	69	181	180
60	57	56	58	59	62	66	69	183	181
76	72	70	73	76	80	85	91	242	239

Total IHG
Watts
[73]

Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
246	232	219	207	202	205	213	225	240	253
230	216	203	191	185	188	196	209	224	237
174	164	155	146	142	144	149	158	169	178
175	165	156	147	143	145	150	159	170	179
230	216	203	191	185	188	196	209	224	237

Etude

						Heat transfer
						W/
						[39
	Jan	Feb	Mar	Apr	May	Jun
Example - Semi Detached House	52	52	52	51	51	51
Plot 3	224	222	221	215	213	207
Plot 4	120	119	118	115	114	110
Plot 6	98	97	97	94	93	90
Plot 9	210	208	207	201	199	194

r coefficient									
/K									
9m]									
Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
51	51	51	51	52	52	61.8	61.8	61.9	62.3
207	207	207	215	216	219	29.7	29.9	30.1	31.0
110	110	110	115	115	117	21.8	21.9	22.1	22.8
90	90	90	94	94	96	25.9	26.1	26.3	27.1
194	194	194	201	202	205	28.5	28.7	28.9	29.7

tau								
calculation step								
May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
62.4	62.7	62.7	62.7	62.7	62.3	62.2	62.0	5.1
31.2	32.1	32.1	32.1	32.1	31.0	30.8	30.3	3.0
22.9	23.6	23.6	23.6	23.6	22.8	22.6	22.3	2.5
27.3	28.2	28.2	28.2	28.2	27.1	26.9	26.5	2.7
29.9	30.8	30.8	30.8	30.8	29.7	29.5	29.1	2.9

alpha

calculation step

Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
5.1	5.1	5.2	5.2	5.2	5.2	5.2	5.2	5.2
3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1
2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.5
2.7	2.8	2.8	2.8	2.9	2.9	2.9	2.9	2.8
2.9	2.9	3.0	3.0	3.1	3.1	3.1	3.1	3.0

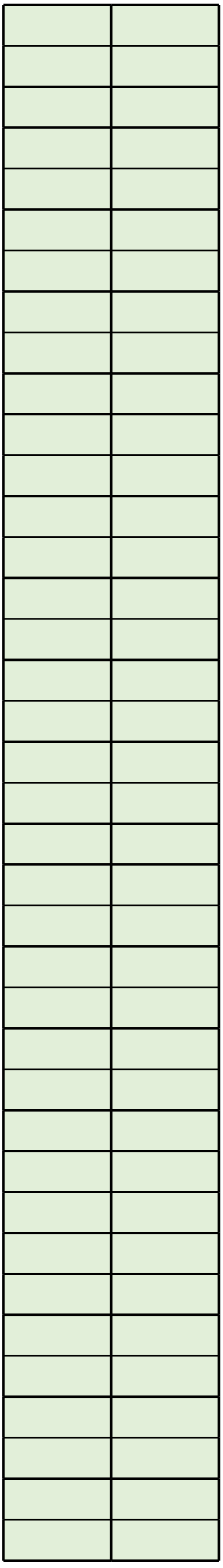
SAP Conversion Tool V2 - PHPP + SAP 10.2								
		L						
		calculation step						
Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
5.1	5.1	794	767	688	561	411	271	184
3.1	3.0	3426	3292	2938	2343	1708	1100	747
2.5	2.5	1833	1760	1570	1250	910	585	397
2.8	2.8	1500	1440	1284	1021	743	477	324
3.0	2.9	3207	3081	2749	2189	1595	1026	697

Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
189	302	479	644	796	0.39	0.46	0.58	0.79
768	1224	1999	2706	3379	0.09	0.12	0.17	0.26
408	651	1066	1444	1805	0.18	0.25	0.34	0.48
333	531	871	1180	1476	0.22	0.31	0.41	0.59
716	1142	1868	2529	3161	0.12	0.16	0.21	0.30

gamma								
calculation step								
May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1.14	1.73	2.41	2.18	1.29	0.72	0.48	0.38	1.00
0.39	0.61	0.86	0.76	0.41	0.20	0.12	0.09	1.00
0.71	1.09	1.55	1.42	0.82	0.42	0.24	0.17	0.99
0.87	1.34	1.90	1.74	1.01	0.51	0.30	0.21	0.99
0.44	0.66	0.95	0.87	0.51	0.27	0.16	0.12	1.00

				Utilisation Factor				
				[94]				
Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
0.99	0.97	0.92	0.78	0.56	0.41	0.45	0.72	0.94
1.00	1.00	0.99	0.96	0.90	0.81	0.85	0.96	0.99
0.98	0.95	0.91	0.82	0.69	0.55	0.59	0.79	0.93
0.97	0.95	0.89	0.79	0.63	0.48	0.52	0.74	0.92
1.00	0.99	0.98	0.95	0.88	0.77	0.80	0.93	0.99

Nov	Dec
0.99	1.00
1.00	1.00
0.98	0.99
0.98	0.99
1.00	1.00



Etude

					Temperature	
					K	
					[39	
	Jan	Feb	Mar	Apr	May	Jun
Example - Semi Detached House	15.3	14.8	13.3	10.9	8.0	5.3
Plot 3	15.3	14.8	13.3	10.9	8.0	5.3
Plot 4	15.3	14.8	13.3	10.9	8.0	5.3
Plot 6	15.3	14.8	13.3	10.9	8.0	5.3
Plot 9	15.3	14.8	13.3	10.9	8.0	5.3

Difference								
X								
9m]								
Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
3.6	3.7	5.9	9.3	12.5	15.4	39	33	33
3.6	3.7	5.9	9.3	12.5	15.4	817	699	680
3.6	3.7	5.9	9.3	12.5	15.4	469	401	391
3.6	3.7	5.9	9.3	12.5	15.4	402	344	335
3.6	3.7	5.9	9.3	12.5	15.4	799	683	665

Infiltration heat loss

kWh

Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
24	17	10	7	7	11	21	28	37
493	365	211	148	152	235	434	578	771
283	209	121	85	87	135	249	332	443
242	179	104	73	75	116	214	284	379
482	357	206	145	149	230	425	566	754

Ventilation heat loss								
kWh								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
83	72	72	57	43	28	19	20	31
106	92	92	73	55	35	25	26	39
68	60	59	47	36	23	16	17	26
68	60	59	47	36	23	16	17	26
106	93	92	73	55	36	25	26	40

			Transmissi					
			kW					
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
50	65	83	464	406	404	320	243	156
64	84	106	1621	1416	1409	1117	848	543
42	54	69	823	719	715	567	430	276
42	54	69	642	561	558	443	336	215
64	84	107	1476	1289	1283	1017	772	495

ion Losses								
Wh								
Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
109	112	173	282	367	467	40	67	114
381	392	605	985	1282	1631	62	110	201
194	199	307	500	650	828	116	176	260
151	155	240	391	508	647	116	175	259
347	357	551	897	1167	1485	117	179	270

Useful solar gains

kWh

Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
145	148	109	76	72	94	86	50	36
281	347	323	285	257	218	144	75	51
298	312	251	200	195	225	206	133	99
292	297	228	175	172	211	203	132	98
320	360	321	281	267	267	217	135	99

Useful internal gains								
kWh								
[95m]								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
191	169	178	153	127	84	62	69	110
180	160	171	154	146	124	112	119	136
133	118	123	107	95	73	58	63	85
134	118	123	106	91	66	51	56	80
179	160	170	152	143	121	106	112	132

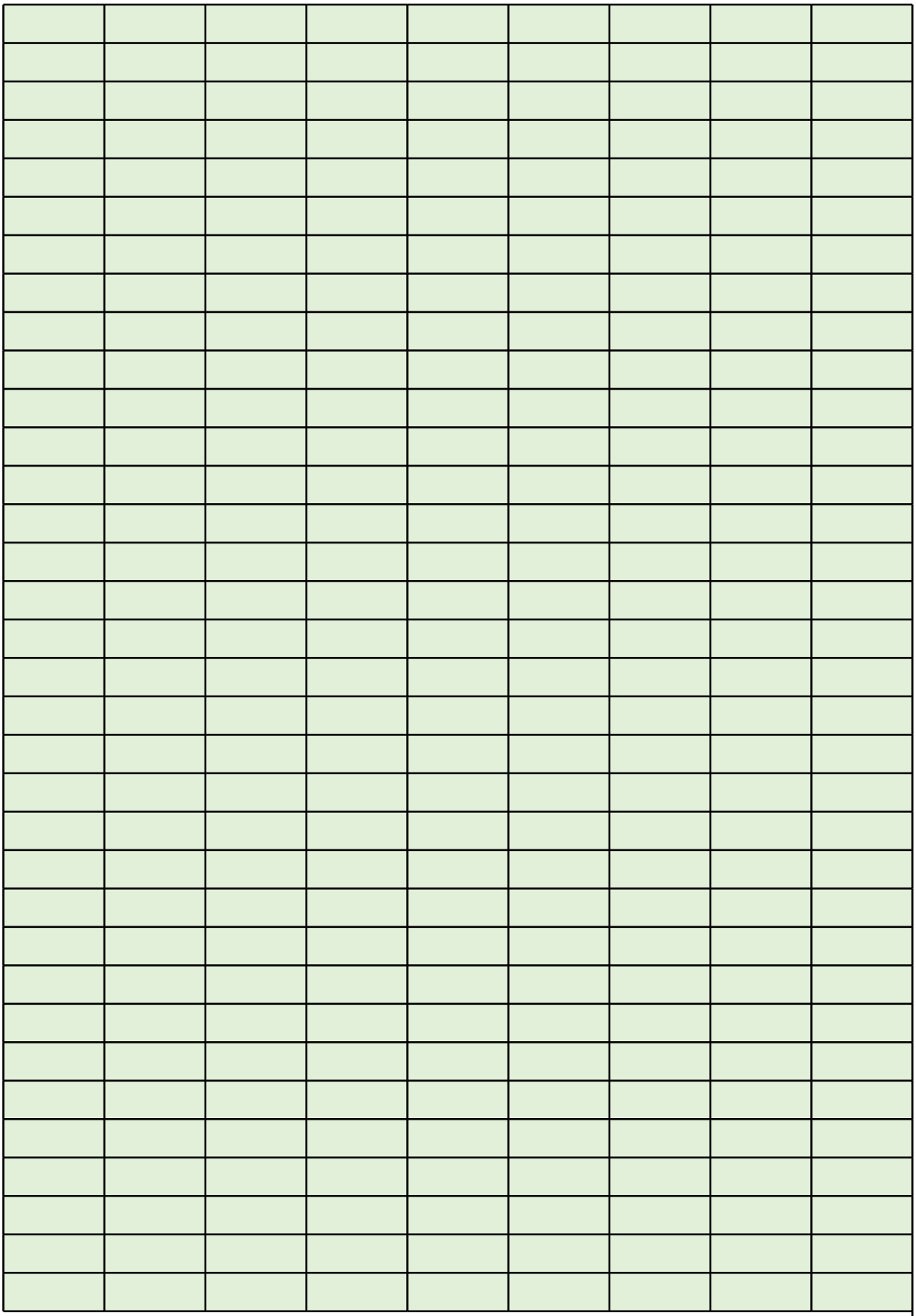
			Space heating Demar					
			kW					
			[98					
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
158	171	188	355	275	216	102	28	0
155	161	176	2301	1937	1810	1248	775	343
110	119	131	1111	886	782	492	268	97
109	119	132	863	672	571	335	163	48
153	161	176	2084	1727	1601	1100	681	295

nd - Initial Value								
Wh								
3m]								
Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
0	0	12	110	239	364	100%	100%	100%
158	194	525	1185	1707	2281	100%	100%	100%
36	45	158	476	785	1109	100%	100%	100%
14	18	90	334	595	864	100%	100%	100%
130	152	421	1016	1521	2071	100%	100%	100%

SAP Conversion Tool V2

Degree hours included in final heat demand calculation

Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
100%	100%	0%	0%	0%	100%	100%	100%	100%
100%	100%	100%	100%	100%	100%	100%	100%	100%
100%	100%	100%	100%	100%	100%	100%	100%	100%
100%	100%	100%	0%	100%	100%	100%	100%	100%
100%	100%	100%	100%	100%	100%	100%	100%	100%



Infiltration heat loss - Reduced degree hours								
kWh								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
39	33	33	24	17	0	0	0	11
817	699	680	493	365	211	148	152	235
469	401	391	283	209	121	85	87	135
402	344	335	242	179	104	0	75	116
799	683	665	482	357	206	145	149	230

			Ventilation heat loss -					
			kW					
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
21	28	37	83	72	72	57	43	0
434	578	771	106	92	92	73	55	35
249	332	443	68	60	59	47	36	23
214	284	379	68	60	59	47	36	23
425	566	754	106	93	92	73	55	36

- Reduced degree hours								
Wh								
Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
0	0	31	50	65	83	464	406	404
25	26	39	64	84	106	1621	1416	1409
16	17	26	42	54	69	823	719	715
0	17	26	42	54	69	642	561	558
25	26	40	64	84	107	1476	1289	1283

Transmission Losses - Reduced degree hours

kWh

Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
320	243	0	0	0	173	282	367	467
1117	848	543	381	392	605	985	1282	1631
567	430	276	194	199	307	500	650	828
443	336	215	0	155	240	391	508	647
1017	772	495	347	357	551	897	1167	1485

Solar Gains - Cap Calculation				Useful solar gains - Capped				
Total Losses	Total Solar Gains	Solar gain proportion of heat loss	Solar Gain above Cap					
3927	1037	26%	0%	40	67	114	145	148
18612	2355	13%	0%	62	110	201	281	347
9929	2471	25%	0%	116	176	260	298	312
7869	2358	30%	0%	116	175	259	292	297
17396	2833	16%	0%	117	179	270	320	360

as a % transmission loss for reduced degree hours								
kWh							Total Solar Gains	Solar gain proportion of heat loss
109	76	72	94	86	50	36	1037	26%
323	285	257	218	144	75	51	2355	13%
251	200	195	225	206	133	99	2471	25%
228	175	172	211	203	132	98	2358	30%
321	281	267	267	217	135	99	2833	16%

Useful solar gains - Reduced degree hours								
kWh								
[95m]								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
40	67	114	145	148	0	0	0	94
62	110	201	281	347	323	285	257	218
116	176	260	298	312	251	200	195	225
116	175	259	292	297	228	0	172	211
117	179	270	320	360	321	281	267	267

			Useful internal gains -					
			W					
			[95					
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
86	50	36	191	169	178	153	127	0
144	75	51	180	160	171	154	146	124
206	133	99	133	118	123	107	95	73
203	132	98	134	118	123	106	91	66
217	135	99	179	160	170	152	143	121

- Reduced degree hours								
W								
5m]								
Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
0	0	110	158	171	188	355	275	216
112	119	136	155	161	176	2301	1937	1810
58	63	85	110	119	131	1111	886	782
0	56	80	109	119	132	863	672	571
106	112	132	153	161	176	2084	1727	1601

Space heating Demand - Reduced degree hours								
kWh								
[98m]								
Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
102	28	0	0	0	12	110	239	364
1248	775	343	158	194	525	1185	1707	2281
492	268	97	36	45	158	476	785	1109
335	163	48	0	18	90	334	595	864
1100	681	295	130	152	421	1016	1521	2071

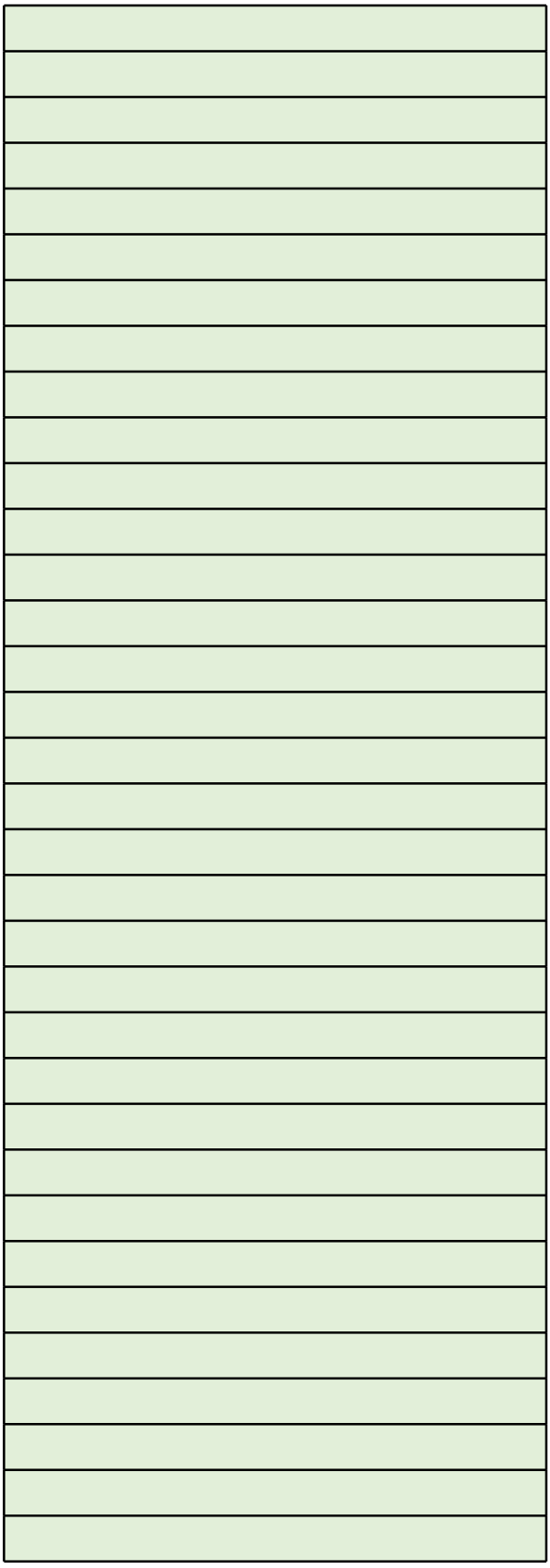
	Space heat demand	Space heating efficiency - primary	Space heating efficiency - secondary	Space heating final energy
	kWh/year	%	%	kWh/year
Example - Semi Detached House	1703	355%	0%	479
Plot 3	14462	100%	0%	14462
Plot 4	6245	100%	0%	6245
Plot 6	4553	100%	0%	4553
Plot 9	12797	100%	0%	12797

SAP Conversion Tool V2

DHW heat demand	DHW efficiency	DHW final energy	Appliances	Cooking	Lighting	Pumps and fans	Total
kWh/year	%	kWh/year	kWh/year	kWh/year	kWh/year	kWh/year	kWh/year
2114	302%	701	1175	213	107	189	2863
1915	427%	448	1191	214	105	359	16779
1354	427%	317	898	187	68	156	7870
1364	427%	319	903	187	68	174	6205
1915	427%	448	1191	214	105	296	15052

	SAP Conversion To
	Energy Generation - Performance Factor Correction
	kWh/year
Example - Semi Detached House	3106
Plot 3	1107
Plot 4	878
Plot 6	661
Plot 9	798

ol V2
Energy Generation - Climate Correction
kWh/year
3137
1118
886
667
806



Etude

Policy Targets		
	1. Space heat demand	15
	1. Space heat demand (accepted upper limit)	20
	2. Total energy	35
	3. Solar generation	100%

Input Worksheet Lists		
	Extreme Shelter	Normal
	Intermittent Extract	Continuous Extract
	Space heat sources:	Heat pump - air to water
	Water heat sources:	Heat pump - air to water

Date Lookups		
		Jan
	Month Number	1
	Days	31

SAP Conversion Tool V2 Internal temperature setpoints	Jan
	20

le U1: Mean external temperature (°C)	Region	Jan
	0 UK average	4.3
	1 Thames	5.1
	2 South East England	5
	3 Southern England	5.4
	4 South West England	6.1
	5 Severn Wales / Severn England	4.9
	6 Midlands	4.3
	7 West Pennines Wales / West Pennines England	4.7
	8 North West England / South West Scotland	3.9
	9 Borders Scotland / Borders England	4
	10 North East England	4
	11 East Pennines	4.3
	12 East Anglia	4.7
	13 Wales	5
	14 West Scotland	4
	15 East Scotland	3.6
	16 North East Scotland	3.3
	17 Highland	3.1

SAP 10 - Tabl

18	Western Isles	5.2
19	Orkney	4.4
20	Shetland	4.6
21	Northern Ireland	4.8

SAP 10 - Table U2: Wind speed (m/s) for calculation of infiltration rate

Region		Jan
0	UK average	5.1
1	Thames	4.2
2	South East England	4.8
3	Southern England	5.1
4	South West England	6
5	Severn Wales / Severn England	4.9
6	Midlands	4.5
7	West Pennines Wales / West Pennines England	4.8
8	North West England / South West Scotland	5.2
9	Borders Scotland / Borders England	5.2
10	North East England	5.3
11	East Pennines	5.1
12	East Anglia	4.9
13	Wales	6.5
14	West Scotland	6.2
15	East Scotland	5.7
16	North East Scotland	5.7
17	Highland	6.5
18	Western Isles	8.3
19	Orkney	7.9
20	Shetland	9.5
21	Northern Ireland	5.4

le U3: Solar radiation on a horizontal plane (W/m²)

Region		Jan
0	UK average	26
1	Thames	30
2	South East England	32
3	Southern England	35
4	South West England	36
5	Severn Wales / Severn England	32
6	Midlands	28
7	West Pennines Wales / West Pennines England	24
8	North West England / South West Scotland	23
9	Borders Scotland / Borders England	23
10	North East England	25
11	East Pennines	26
12	East Anglia	30
13	Wales	29
14	West Scotland	19
15	East Scotland	21
16	North East Scotland	19
17	Highland	17

SAP 10 - Tabl

18	Western Isles	16
19	Orkney	14
20	Shetland	12
21	Northern Ireland	24

Table 3.1 Occupancy Adjustment factors

	Asymptote of sigmoid	Width of sigmoid
SAP 10	1.76	-0.000349
SAP Convers	1.76	-0.000349

Wind Protection Coefficient, f

Extreme Shelter	Normal
0.04	0.07

Part F - Table 1.3 Minimum whole dwelling ventilation rates

Bedrooms	l/s
1	19
2	25
3	31
4	37
5	43
6	49
7	55
8	61
9	67
10	73

SAP 10 Appendix J Tables

Table 1d: Temperature rise of hot water drawn off (from SAP 2012)	**Jan**
	41.2
Table J1: Cold water temperatures	**Jan**
From header tank	11.1
From mains	8
Table J2: Monthly factors for hot water use	**Jan**
	1.1
Table J5: Behavioural factor for showers and baths	**Jan**
	1.035

stants

	SAP 10 -
	Constant 1
Metabolic	60
Lighting	
Appliances	
Cooking	35

Internal Heat Gain Cons		
	Pump (boiler only)	3
	Ventilation - Extract or Positive Input Fans	
	Ventilation - MVHR	
	Evaporative losses	-40
	DHW - Energy content of hot water and combi losses	
	DHW - Distribution, storage and primary circuit losses	
	DHW - Extra factor for all losses	

Appliance Energy

	SAP10	
	Constant 1	Constant 2
	207.8	0.4714

Cooking Energy

	SAP 10	
	Fixed Energy	Variable Energy
	138	28

Lighting energy		
800	Lumens per lamp	
5.0	Lamps per person	
1200	Hours per person per year	

Transmission heat loss constant		
0%	Increase above SAP value	Adjustment applied to t

Dwelling volume adjustment		
8%	Volume due to internal walls	
0.3	Depth of intermediate floors (m)	Used to convert AP rate

Infiltration and Ventilation Constants		
0%	Infiltration rate constant for monthly calculation	Adjustment applied to i
-5%	Ventilation rate constant	Adjustment applied to v

Solar Gains Cap	
50%	Max annual percentage of transmission losses

Space Heating Season Adjustment		
0.4%	Monthly heat demand as a percentage of annual	Heating system assumed
0%	Percentage heat loss included in cut-off months	

Heat Pump Efficiency Adjustment	
15%	Space heating
60%	Water heating

Solar Photovoltaic Performance Factor		
SAP 10	Conversion Tool V2	
80%	85%	Based on University of

kWh/m2.yr
kWh/m2.yr
kWh/m2.yr
of total energy

Extreme Exposure			
Positive Input	MVHR		
Heat pump - air to air	Heat pump - ground to water	Direct electric	Gas/oil boiler - combi
Heat pump - ground to water	Direct electric	Gas/oil boiler - combi	Gas/oil/biomass boiler

Feb	Mar	Apr	May
2	3	4	5
28	31	30	31

Feb	Mar	Apr	May
20	20	20	20

Feb	Mar	Apr	May
4.9	6.5	8.9	11.7
5.6	7.4	9.9	13
5.4	7.1	9.5	12.6
5.7	7.3	9.6	12.6
6.4	7.5	9.3	11.9
5.3	7	9.3	12.2
4.8	6.6	9	11.8
5.2	6.7	9.1	12
4.3	5.6	7.9	10.7
4.5	5.8	7.9	10.4
4.6	6.1	8.3	10.9
4.9	6.5	8.9	11.7
5.2	7	9.5	12.5
5.3	6.5	8.5	11.2
4.4	5.6	7.9	10.4
4	5.4	7.7	10.1
3.6	5	7.1	9.3
3.2	4.4	6.6	8.9

5	5.8	7.6	9.7
4.2	5	7	8.9
4.1	4.7	6.5	8.3
5.2	6.4	8.4	10.9

Feb	Mar	Apr	May
5	4.9	4.4	4.3
4	4	3.7	3.7
4.5	4.4	3.9	3.9
4.7	4.6	4.3	4.3
5.6	5.6	5	5
4.6	4.7	4.3	4.3
4.5	4.4	3.9	3.8
4.7	4.6	4.2	4.1
5.2	5	4.4	4.3
5.2	5	4.4	4.1
5.2	5	4.3	4.2
5	4.9	4.4	4.3
4.8	4.7	4.2	4.2
6.2	5.9	5.2	5.1
6.2	5.9	5.2	4.9
5.8	5.7	5	4.8
5.8	5.7	5	4.6
6.8	6.4	5.7	5.1
8.4	7.9	6.6	6.1
8.3	7.9	7.1	6.2
9.4	8.7	7.5	6.6
5.3	5	4.7	4.5

Feb	Mar	Apr	May
54	96	150	192
56	98	157	195
59	104	170	208
62	109	172	209
63	111	174	210
59	105	167	201
55	97	153	191
51	95	152	191
51	95	157	200
50	92	151	200
51	95	152	196
54	96	150	192
58	101	165	203
57	104	164	205
46	88	148	196
46	89	146	198
45	89	143	194
43	85	145	189

41	87	155	205
39	84	143	205
34	79	135	196
52	96	155	201

Linea component	Offset
0.0013	13.9
0.0013	13.9

Extreme Exposure
0.1

Feb	Mar	Apr	May
41.4	40.1	37.6	36.4

Feb	Mar	Apr	May
11.3	12.3	14.5	16.2
8.2	9.3	12.7	14.6

Feb	Mar	Apr	May
1.06	1.02	0.98	0.94

Feb	Mar	Apr	May
1.021	1.007	0.993	0.979

- Typical Gains (Tables 5 and 5a)		Conversion Tool V2	
Constant 2	Availability	Constant 1	Constant 2
	100%	80	
	85%		
	100%		
7	100%	23	5

	100%	3	
	12%		
	6%		
	100%	-40	
	85%		
	80%		
	25%		

Conversion Tool V2			
End Use	Energy per Use (kWh)	Frequency of Use	Unit of Use
Refrigeration	0.61	365	Days
Dishwashing	0.92	65	Per Occupant
Clothes Washing	0.79	57	Per Occupant
Clothes Drying	2.13	57	Per Occupant
Small Devices	150	1	Per Dwelling
Small Devices	75	1	Per Occupant

Conversion Tool V2	
Fixed Energy	Variable Energy
138	28

transmission heat losses

e to ACH (prior to divisors)

infiltration rate monthly calculation - currently unused
ventilation rates

to be turned down/off during months when heat demand is below this value

Sheffield performance factors for 7,000+ systems in the UK

Gas/oil/biomass boiler

Note: If adding any new heat sources, ensure DHW loss calculations are updated to ensure prima

Jun	Jul	Aug	Sep	Oct	Nov	Dec
6	7	8	9	10	11	12
30	31	31	30	31	30	31

Jun	Jul	Aug	Sep	Oct	Nov	Dec
20	20	20	20	20	20	20

Jun	Jul	Aug	Sep	Oct	Nov	Dec
14.6	16.6	16.4	14.1	10.6	7.1	4.2
16	17.9	17.8	15.2	11.6	8	5.1
15.4	17.4	17.5	15	11.7	8.1	5.2
15.4	17.3	17.3	15	11.8	8.4	5.5
14.5	16.2	16.3	14.6	11.8	9	6.4
15	16.7	16.7	14.4	11.1	7.8	4.9
14.8	16.6	16.5	14	10.5	7.1	4.2
14.7	16.4	16.3	14.1	10.7	7.5	4.6
13.2	14.9	14.8	12.8	9.7	6.6	3.7
13.3	15.2	15.1	13.1	9.7	6.6	3.7
13.8	15.8	15.6	13.5	10.1	6.7	3.8
14.6	16.6	16.4	14.1	10.6	7.1	4.2
15.4	17.6	17.6	15	11.4	7.7	4.7
13.7	15.3	15.3	13.5	10.7	7.8	5.2
13	14.5	14.4	12.5	9.3	6.5	3.8
12.9	14.6	14.5	12.5	9.2	6.1	3.2
12.2	14	13.9	12	8.8	5.7	2.9
11.4	13.2	13.1	11.3	8.2	5.4	2.7

11.8	13.4	13.6	12.1	9.6	7.3	5.2
11.2	13.1	13.2	11.7	9.1	6.6	4.3
10.5	12.4	12.8	11.4	8.8	6.5	4.6
13.5	15	14.9	13.1	10	7.2	4.7

Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.8	3.8	3.7	4	4.3	4.5	4.7
3.3	3.4	3.2	3.3	3.5	3.5	3.8
3.6	3.7	3.5	3.7	4	4.1	4.4
4	4	3.9	4	4.5	4.4	4.7
4.4	4.4	4.3	4.7	5.4	5.5	5.9
3.8	3.8	3.7	3.8	4.3	4.3	4.6
3.4	3.3	3.3	3.5	3.8	3.9	4.1
3.7	3.7	3.7	3.7	4.2	4.3	4.5
3.9	3.7	3.7	4.1	4.6	4.8	4.7
3.8	3.5	3.5	3.9	4.2	4.6	4.7
3.9	3.6	3.6	4.1	4.3	4.6	4.8
3.8	3.8	3.7	4	4.3	4.5	4.7
3.7	3.8	3.8	4	4.2	4.3	4.5
4.7	4.5	4.5	5	5.7	6	6
4.7	4.3	4.3	4.9	5.4	5.7	5.4
4.6	4.1	4.1	4.7	5	5.2	5
4.4	4	4.1	4.6	5.2	5.3	5.1
5.1	4.6	4.5	5.3	5.8	6.1	5.7
6.1	5.6	5.6	6.3	7.3	7.7	7.5
6.1	5.5	5.6	6.4	7.3	7.8	7.3
6.4	5.7	6	7.2	8.5	8.9	8.5
4.1	3.9	3.7	4.2	4.6	5	5

Jun	Jul	Aug	Sep	Oct	Nov	Dec
200	189	157	115	66	33	21
217	203	173	127	73	39	24
231	216	182	133	77	41	25
235	217	185	138	80	44	27
233	204	182	136	78	44	28
226	206	175	130	74	40	25
208	194	163	121	69	35	23
203	186	152	115	65	31	20
203	194	156	113	62	30	19
196	187	153	111	61	30	18
198	190	156	115	64	32	20
200	189	157	115	66	33	21
220	206	173	128	74	39	24
220	199	167	120	68	35	22
193	185	150	101	55	25	15
191	183	150	106	57	27	15
188	177	144	101	54	25	14
185	170	139	98	51	22	12

206	185	148	101	51	21	11
201	178	145	100	50	19	9
190	168	144	90	46	16	7
198	183	150	107	61	30	18

Jun	Jul	Aug	Sep	Oct	Nov	Dec
33.9	30.4	33.4	33.5	36.3	39.4	39.9

Jun	Jul	Aug	Sep	Oct	Nov	Dec
18.8	21.3	19.3	18.7	16.2	13.2	11.2
16.7	18.4	17.6	16.6	14.3	11.1	8.5

Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9	0.9	0.94	0.98	1.02	1.06	1.1

Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.965	0.965	0.979	0.993	1.007	1.021	1.035

	Note: SAP 10 typical gains do not apply to DPER, TPER, DER, and TER calculations. These use re
Availability	
55%	Note: SAP Conversion Tool V2 uses the PHPP assumption of 80W/person, with an availability of 5
85%	Note: SAP Conversion Tool V2 uses the SAP 10 formula for standard gains. As lighting gains fro
67%	Note: SAP Conversion Tool V2 assumes reduced gains availability to account for appliance gains
50%	Note: SAP Conversion Tool V2 uses the SAP 10 reduced gains values from column B of Table 5. Sa

100%	Note: SAP Conversion Tool V2 uses same value as SAP 10, see Table 5a
12%	Note: SAP Conversion Tool V2 uses same value as SAP 10, see Table 5a
6%	Note: SAP Conversion Tool V2 uses same value as SAP 10, see Table 5a
100%	Note: SAP Conversion Tool V2 uses same value as SAP 10, see Table 5a
85%	Note: SAP Conversion Tool V2.3 assumes same gains from hot water as SAP 10.
75%	Note: SAP Conversion Tool V2.3 assumes 75% from BS ISO standard. Primary circuit loss is parti
25%	

ary and combi losses are included if necessary.

SAP Conversion Tool V2 - Solar Adjustment	Validated?
0%	NO
0%	NO
0%	NO
0%	NO
0%	YES
16%	YES
0%	NO
1%	YES
0%	NO
0%	NO
0%	NO
0%	NO
5%	YES
0%	NO
0%	NO
0%	NO
0%	NO
0%	NO

0%	NO
0%	NO
0%	NO
0%	NO

Average
4.4
3.6
4.0
4.4
5.1
4.3
3.9
4.2
4.5
4.3
4.4
4.4
4.3
5.4
5.3
5.0
5.0
5.6
6.9
6.9
7.7
4.6

Adjustment
-1%
-8%
-1%
-11%
1%
-11%
3%
-15%
-4%
-6%
-4%
-1%
2%
-3%
1%
-1%
1%

-11%
-17%
-4%
-3%

Annual
1

educed values from SAP Table 5.

55% = 44W/person. This is similar to the SAP 10 reduced gains assumption of 50W/person from Table 5.
om modern LED lighting are relatively small, the reduced gains formulae was not deemed worth the additi
s that are lost due to drain water, venting of tumble dryer air, and some proportion of energy use ocur
ame assumption as PHPP for percentage availability.

ially outside, so gains are less useful. Could differentiate between primary distribution, secondary di

ional complexity.

rring outside.

istribution, and storage loss availability in future ver