

appendix d – renewables spreadsheets...

07 / 3470 / FUL

MTT/SUSTAIN

Calculation Sheet

Project: Waldegrave Arms, Teddington
Subject: Renewable Energy Assessment
Engineer: Caroline Stanton
Checked By: Martin Lawless

Job Number: 3066
Sheet Number: 23 of 40
Date: 24th September 2007
Date: 24th September 2007

23 BIOMASS COMBINED HEAT AND POWER - STORAGE AREAS

Description of Calculation Step	Value	Unit	Step	Calculation/Note
Determine the total DELIVERED Gas energy requirement in the base site for and uses that are to be served by Biomass CHP	190,530	kWh/year	(1)	Q
Determine the heating system efficiency in base site	90	%	(2)	
Calculate end use DEMAND met accounting for system efficiency in base site	171,477	kWh/year	(3)	(1) x (2)
Specify the proportion of end use DEMAND met by Biomass CHP	50	%	(4)	
Calculate annual energy DEMAND for heating met by Biomass CHP	85,739	kWh/year	(5)	(3) x (4)
Number of deliveries of fuel per year required	12	-	(6)	
Energy density by mass of WOOD CHIP	2	kWh/kg	(7)	
Calculate the weight of WOOD CHIP required to power the boiler per delivery of fuel	3,572	kg/delivery	(8)	(5) / (6) / (7)
Energy density by mass of WOOD PELLETS	5	kWh/kg	(9)	
Calculate the weight of WOOD PELLETS required to power the boiler per delivery of fuel	1,429	kg/delivery	(10)	(5) / (6) / (9)
Height of storage hopper in building	2	m	(13)	
Determine the weight per unit volume of WOOD CHIP	175	kg/m ³	(14)	
Volume of storage required to store WOOD CHIP per delivery	20	m ³	(15)	(8) x (14)
Determine the weight per unit volume of WOOD PELLETS	600	kg/m ³	(16)	
Volume of storage required to store WOOD PELLETS per delivery	2	m ³	(17)	(10) x (16)
Determine the storage area required for the storage of WOOD CHIP with the required storage height	10	m ²	(20)	(15) x (13)
Determine the storage area required for the storage of WOOD PELLETS with the required storage height	1	m ²	(21)	(17) x (13)
Energy price for Biomass WOOD CHIP	2.1	p/kWh	(18)	
Determine the annual cost of WOOD CHIP	1,801	£/year	(22)	(5) x (18)
Energy price for Biomass WOOD PELLETS	3.5	p/kWh	(19)	
Determine the annual cost of WOOD PELLETS	3,001	£/year	(23)	(5) x (19)

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Calculation Sheet

Project: Waldegrave Arms, Teddington
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Job Number: 3066
Sheet Number: 24 of 40
Date: 24th September 2007
Date: 24th September 2007

24 GROUND COOLING (MAXIMUM AREA AVAILABLE 1,000 SQ M)

Description of Calculation Step	Value	Unit	Step	Calculation/Note
Determine the total DELIVERED Electricity requirement for the end uses that are to be served by Ground cooling	-	kWh/year	(1)	W
Determine the coefficient of performance (COP) for the base site conventional refrigeration plant	3.2	#(> 1)**	(2)	(2)
Calculate end use refrigeration DEMAND met accounting for system efficiency/coefficient of performance	-	kWh/year	(3)	(1) x (2)
Specify the proportion of end use DEMAND met by ground cooling	100	%	(4)	(4)
Calculate annual Electricity DEMAND for refrigeration met by ground cooling	-	kWh/year	(5)	(3) x (4)
Determine seasonal plant output per m2 of ground coupled area	10.00	kWh/m2 (GCA)/year	(6)	(6)
Calculate ground coupled area (GCA) to meet cooling demand	1,000	m2 (GCA)	(7)	(5) / (6)
Determine installed ground cooling capacity rate per m2 of ground coupled area	0.045	kW/m2 (GCA)	(8)	(8)
Calculate installed capacity of ground cooling system to meet predicted demand	45.00	kW	(9)	(7) x (8)
Calculate annual equivalent hours of full load operation of the ground cooling system	0.00	hours	(10)	(9) / (9)
Determine circulation pump capacity	20	kW	(11)	(11)
Calculate Electricity energy used for ground cooling circulation pump	0	kWh/year	(12)	(10) x (11)
Determine total DELIVERED Electricity in base development	197,078	kWh/year	(13)	Z
Calculate delivered Electricity requirement SUBSTITUTED BY ground cooling	-	kWh/year	(14)	(13) x (4)
Calculate DELIVERED Electricity requirement for site with ground cooling	197,078	kWh/year	(15)	(13) - (14) + (12)
Look up Carbon Emissions factor for Electricity	0.181	kgC/kWh	(16)	(16)**
Calculate Carbon Emissions due to DELIVERED Electricity in site with ground cooling	22,682	kgC/year	(17)	(15) x (16)
Calculate total DELIVERED Gas energy in base site	190,530	kWh/year	(18)	S
Look up Carbon Emissions factor for Gas	0.05291	kgC/kWh	(19)	(19)
Calculate Carbon Emissions due to DELIVERED Gas in site with ground cooling	10,081	kgC/year	(20)	(18) x (19)
Calculate total site Carbon Emissions with ground cooling	32,763	kgC/year	(21)	(17) + (20)
Calculate base site total Carbon Emissions	32,763	kgC/year	(22)	(21) x (16) + (18) x (19)
Calculate reduction in Carbon Emissions due to ground cooling	0	kgC/year	(23)	(22) - (21)
Calculate percentage Carbon Emissions reduction due to application of ground cooling	0.00	%	(24)	(23) / (22)

NOTES

- Based on Table 4.5.7 on the Renewables Toolkit
- (2) - Seasonal Plant Output (SPO) taken as 10 kWh/m²/year from Renewables Toolkit
- (8) - installed ground Cooling Capacity Rate (ICCR) taken as 0.045 kW/m² GCA from Renewables Toolkit



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Calculation Sheet

Project: Waldegrave Arms, Teddington Job Number: 3066
 Subject: Renewable Energy Assessment Sheet Number: 25 of 40
 Engineer: Caroline Stanton Date: 24th September 2007
 Checked By: Martin Lawless Date: 24th September 2007

25 GROUND SOURCE HEAT PUMP HEATING - PREDICTED PAYBACK PERIOD

Description of Calculation Step	Value	Unit	Step	Calculation/Note
DELIVERED Gas energy requirement in the base site for end uses served by Ground Cooling	190,530	kWh/year	(1)	
DELIVERED Gas requirement for site with proposed Ground Cooling	190,530	kWh/year	(2)	
Net Gas energy saving with proposed Ground Cooling	0.00	kWh/year	(3)	
DELIVERED Electricity to BASE development	197,078	kWh/year	(5)	
DELIVERED Electricity with proposed Ground Cooling	197,078	kWh/year	(7)	
Net Electricity energy saving with proposed Ground Cooling	0.0	kWh/year	(3)	
Energy price for Gas to serve proposed Ground Cooling	1.63	p/kWh	(4)	
Energy price for Electricity to serve proposed Ground Cooling	3.65	p/kWh	(8)	
Annual Gas energy cost change with Ground Cooling incorporated	0.00	£/year	(9)	
Annual Electricity energy cost change with Ground Cooling incorporated	0.00	£/year	(10)	
Annual Total energy cost change with Ground Cooling incorporated	0.00	£/year	(11)	
Cost of proposed Ground Cooling	0	£	(11)	
Payback period for proposed Ground Cooling served by Electricity	-	years	(12)	

NOTES

1. Based on Table 4.5.6 on the Renewables Toolkit

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Calculation Sheet

Project: Waldegrave Arms, Teddington Job Number: 3066
 Subject: Renewable Energy Assessment Sheet Number: 26 of 40
 Engineer: Caroline Stanton Date: 24th September 2007
 Checked By: Martin Lawless Date: 24th September 2007

26 GROUND SOURCE HEAT PUMP - HEATING

Description of Calculation Step	Value	Unit	Step	Calculation/Note
Determine the total DELIVERED Gas energy requirement in the base site for end uses served by GSH-P heating	190,530	kWh/year	(1)	G
Determine heating system efficiency in base site	90	%	(2)	(2)
Calculate end use DEMAND met accounting for system efficiency	171,477	kWh/year	(3)	(1) x (2)
Specify proportion of end use DEMAND met by GSH-P heating	75	%	(4)	(4)
Calculate annual energy DEMAND for heating and hot water met by GSH-P	128,608	kWh/year	(5)	(3) x (4)
Specify CoP of the ground source heat pump	3.50		(6)	(6)
Calculate Electricity energy used by heat pump	36,745	kWh/year	(7)	(5) / (6)
Calculate total DELIVERED Gas energy in base site including water heating	190,530	kWh/year	(8)	S
Calculate DELIVERED Gas requirement substituted by GSH-P heating	142,898	kWh/year	(9)	(5) / (2)
Calculate remaining requirement for DELIVERED Gas (to serve remaining hot water after application of GSH-P heating)	47,633	kWh/year	(10)	(8) - (9)
Look up Carbon Emissions factor for Gas	0.05291	kgC/kWh	(11)	(11)
Calculate total emissions due to DELIVERED Gas in site with GSH-P	2,520	kgC/year	(12)	(10) x (11)
Calculate total DELIVERED Electricity in base site	197,078	kWh/year	(13)	Z
Calculate DELIVERED Electricity requirement for site with GSH-P heating	233,823	kWh/year	(14)	(7) + (13)
Look up Carbon Emissions factor for Electricity	0.1151	kgC/kWh	(15)	(15)
Calculate Carbon Emissions due to DELIVERED Electricity in site with GSH-P heating	26,912	kgC/year	(16)	(14) x (15)
Calculate Carbon Emissions in site with ground source heat pumps	29,432	kgC/year	(17)	(12) + (16)
Calculate base site total Carbon Emissions	32,763	kgC/year	(18)	(18) x (11) + (13) x (15)
Calculate reduction in Carbon Emissions due to application of GSH-P heating	3,331	kgC/year	(19)	(18) - (17)
Calculate percentage Carbon Emissions reduction due to application of GSH-P heating	10.17	%	(20)	(19) / (17)

NOTES

1. Based on Table 4.5.6 on the Renewables Toolkit
2. GSH-P sizing based on delivered energy for space heating

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Calculation Sheet

Project: Waldegrave Arms, Teddington
Subject: Renewable Energy Assessment
Engineer: Caroline Stanton
Checked By: Martin Lawless
Job Number: 3066
Sheet Number: 27 of 40
Date: 24th September 2007
Date: 24th September 2007

27 GROUND SOURCE HEAT PUMP HEATING - PREDICTED PAYBACK PERIOD

Description of Calculation Step	Value	Unit	Step	Calculation/Note
DELIVERED Gas energy requirement in the base site for end uses served by GSHP	190,530	kWh/year	(1)	
DELIVERED Gas requirement for site with proposed GSHP Heating	47,633	kWh/year	(2)	
Net Gas energy saving with proposed GSHP Heating	142,898	kWh/year	(3)	
DELIVERED Electricity to BASE development	197,078	kWh/year	(5)	
DELIVERED Electricity with proposed GSHP Heating	233,823	kWh/year	(7)	
Net Electricity energy saving with proposed GSHP Heating	-36,745	kWh/year	(3)	
Energy price for Gas to serve proposed GSHP Heating	1.63	p/kWh	(4)	
Energy price for Electricity to serve proposed GSHP Heating	3.65	p/kWh	(8)	
Annual Gas energy cost change with GSHP incorporated	2,329	£/year	(9)	
Annual Electricity energy cost change with GSHP incorporated	-1,341.20	£/year	(10)	
Annual Total energy cost change with GSHP incorporated	988.04	£/year	(10)	
Cost of proposed GSHP Heating	56,120	£	(11)	
Payback period for proposed GSHP Heating served by Electricity	56.80	years	(12)	

NOTES

1. Based on Table 4.5.6 on the Renewables Toolkit
2. Based on a 70kW system size

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Calculation Sheet

Project: Waldegrave Arms, Teddington
Subject: Renewable Energy Assessment
Engineer: Caroline Stanton
Checked By: Martin Lawless
Job Number: 3066
Sheet Number: 28 of 40
Date: 24th September 2007
Date: 24th September 2007

28 GROUND SOURCE HEAT PUMP - COOLING

Description of Calculation Step	Value	Unit	Step	Calculation/Note
Determine the total DELIVERED Electricity requirement for the end uses that are to be served by GSHP cooling	0	kWh/year	(1)	1
Determine the coefficient of performance (CoP) for the base site conventional refrigeration plant	3.2		(2)	
Calculate end use DEMAND met accounting for system efficiency/coefficient of performance	0	kWh/year	(3)	
Specify the proportion of end use DEMAND met by GSHP cooling	100	%	(4)	
Calculate total DELIVERED Electricity energy in base site	197,078	kWh/year	(5)	
Calculate DELIVERED Electricity requirement substituted by GSHP cooling	0	kWh/year	(6)	
Specify CoP of the ground source heat pump	4		(7)	
Calculate Electricity energy used by heat pump	0	kWh/year	(8)	
Calculate remaining requirement for DELIVERED Electricity	197,078	kWh/year	(9)	
Look up Carbon Emissions factor for Electricity	0.115091	kgC/kWh	(10)	
Calculate total emissions due to DELIVERED Electricity in site with GSHP	22,682	kgC/year	(11)	
Calculate total DELIVERED Gas in base site	190,530	kWh/year	(12)	
Look up Carbon Emissions factor for Gas	0.052909	kgC/kWh	(13)	
Calculate Carbon Emissions due to DELIVERED Gas in site with GSHP	10,081	kgC/year	(14)	
Calculate Carbon Emissions in base build	32,763		(15)	
Calculate Carbon Emissions reduction due to application of Ground Source Heat Pump Cooling	0	kgC/year	(16)	
Calculate percentage Carbon Emissions reduction due to application of ground source heat pumps	0.00	%	(17)	

NOTES

1. GSHP sizing based on delivered energy for space cooling



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Calculation Sheet

Project: Waldegrave Arms, Teddington Job Number: 3066
 Subject: Renewable Energy Assessment Sheet Number: 29 of 40
 Engineer: Caroline Stanton Date: 24th September 2007
 Checked By: Martin Lawless Date: 24th September 2007

29 GROUND SOURCE HEAT PUMP COOLING - PREDICTED PAYBACK PERIOD

Description of Calculation Step	Value	Unit	Step	Calculation/Note
DELIVERED Gas energy requirement in the base site for end uses served by GSHP	190530	kWh/year	(1)	
DELIVERED Gas requirement for site with proposed GSHP Cooling	190530	kWh/year	(2)	
Net Gas energy saving with proposed GSHP Cooling	0.00	kWh/year	(3)	
DELIVERED Electricity to BASE development	197078	kWh/year	(5)	
DELIVERED Electricity with proposed GSHP Cooling	197078	kWh/year	(7)	
Net Electricity energy saving with proposed GSHP Cooling	0.00	kWh/year	(3)	
Energy price for Gas to serve proposed GSHP Cooling	1.63	p/kWh	(4)	
Energy price for Electricity to serve proposed GSHP Cooling	3.65	p/kWh	(8)	
Annual Gas energy cost change with GSHP incorporated	0.00	£/year	(9)	
Annual Electricity energy cost change with GSHP incorporated	0.00	£/year	(10)	
Annual Total energy cost change with GSHP incorporated	0.00	£/year	(10)	
Cost of proposed GSHP Cooling	0	£	(11)	
Payback period for proposed GSHP Cooling served by Electricity	-	years	(12)	

1. Based on Table 4.5.6 on the Renewables Toolkit

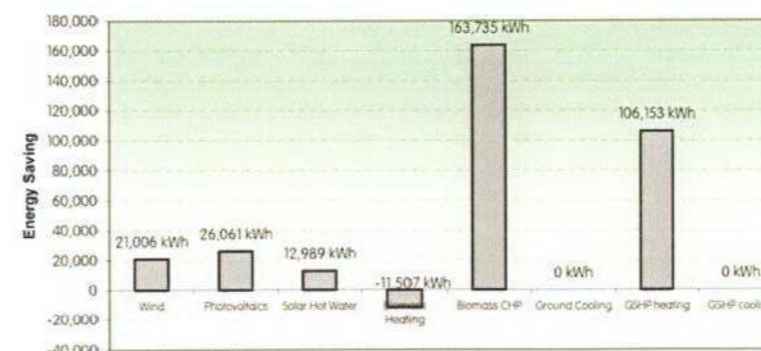
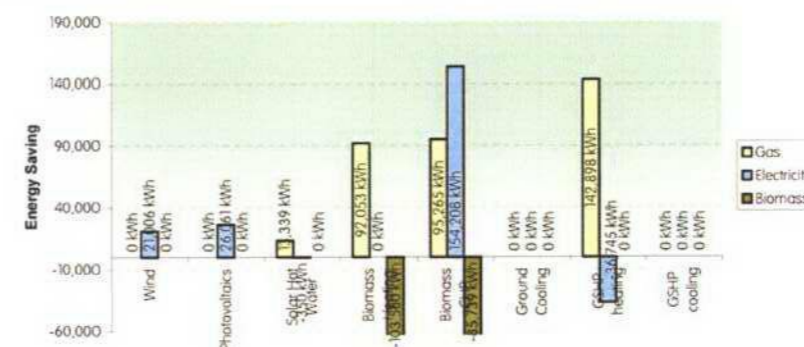
Calculation Sheet

Project: Waldegrave Arms, Teddington Job Number: 3066
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 Engineer: Caroline Stanton Date: 24th September 2007
 Checked By: Martin Lawless Date: 24th September 2007

30 SITE WIDE RENEWABLES IMPLEMENTATION - ENERGY VALUES WITH RENEWABLE TECHNOLOGY

SUMMARY - ENERGY VALUES WITH RENEWABLE INCLUDED

ID	Type	Gas Energy kWh/year	Electric Energy kWh/year	Biomass Energy kWh/year
1	Wind	0	21,006	0
2	Photovoltaics	0	26,061	0
3	Solar Hot Water	13,339	-350	0
4	Biomass Heating	92,053	0	-103,560
5	Biomass CHP	95,265	154,208	-85,739
6	Ground Cooling	0	0	0
7	Ground Source Heat Pump Heating	142,898	-36,745	0
8	Ground Source Heat Pump Cooling	0	0	0



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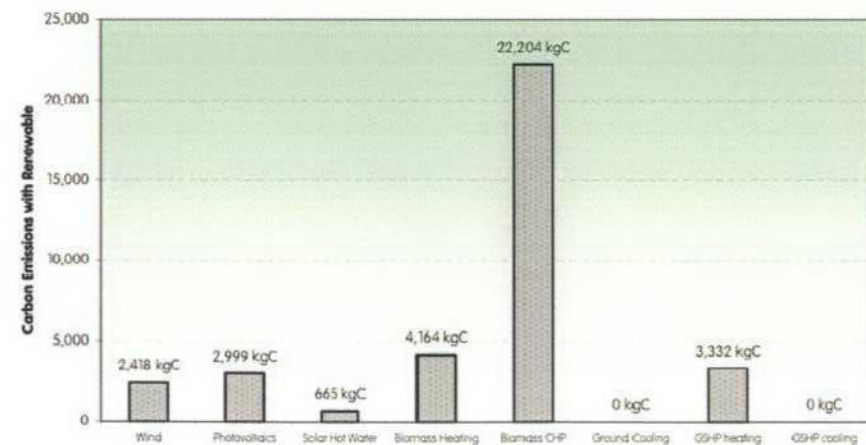
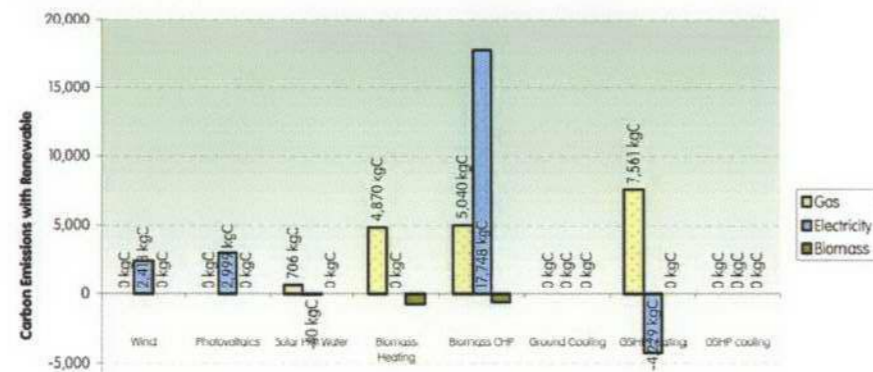
Calculation Sheet

Project: Waldegrave Arms, Teddington Job Number: 3066
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 Engineer: Caroline Stanton Date: 24th September 2007
 Checked By: Marlin Lawless Date: 24th September 2007

31 SITE WIDE RENEWABLES IMPLEMENTATION - CARBON EMISSIONS WITH RENEWABLE TECHNOLOGY

SUMMARY - CARBON EMISSIONS WITH RENEWABLE INCLUDED

ID	Type	Gas C Emissions kgC/year	Electricity C Emissions kgC/year	Biomass C Emissions kgC/year
1	Wind	0	2,418	0
2	Photovoltaics	0	2,999	0
3	Solar Hot Water	706	-40	0
4	Biomass Heating	4,870	0	-706
5	Biomass CHP	5,040	17,748	-585
6	Ground Cooling	0	0	0
7	Ground Source Heat Pump Heating	7,561	-4,229	0
8	Ground Source Heat Pump Cooling	0	0	0



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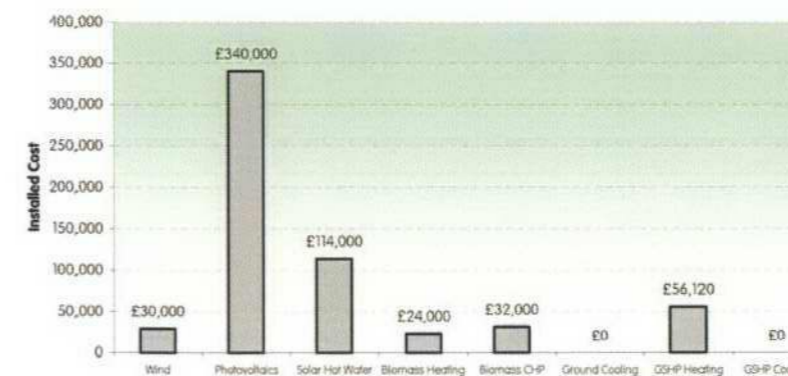
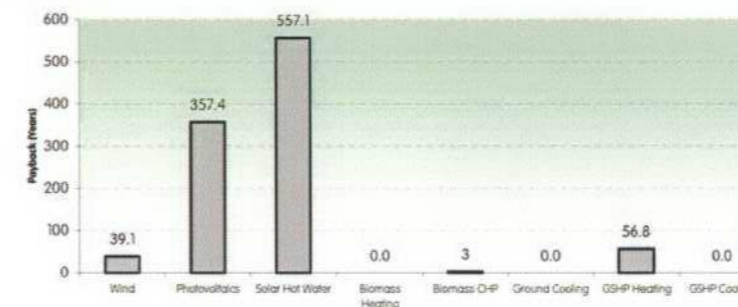
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32 SITE WIDE RENEWABLES IMPLEMENTATION - RENEWABLES COSTS AND PAYBACK

SUMMARY - PAYBACK PERIODS FOR EACH RENEWABLE COVERED

ID	Type	Payback Period Years	Installed Cost £
1	Wind	39.1	30,000
2	Photovoltaics	357.4	340,000
3	Solar Hot Water	557.1	114,000
4	Biomass Heating	NA	24,000
5	Biomass CHP	3.0	32,000
6	Ground Cooling	-	0
7	Ground Source Heat Pump Heating	57	56,120
8	Ground Source Heat Pump Cooling	-	0



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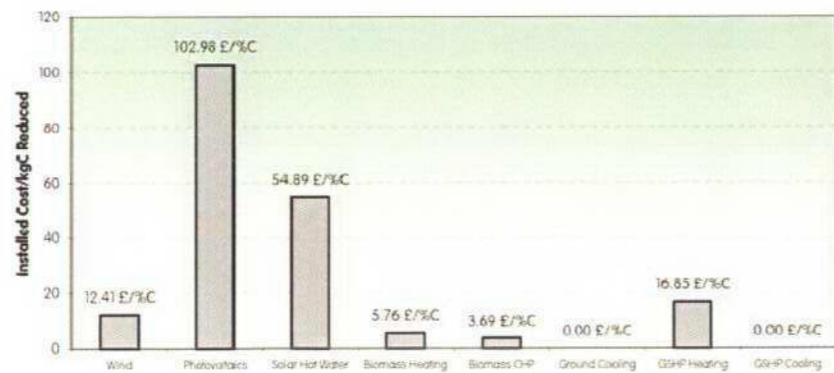
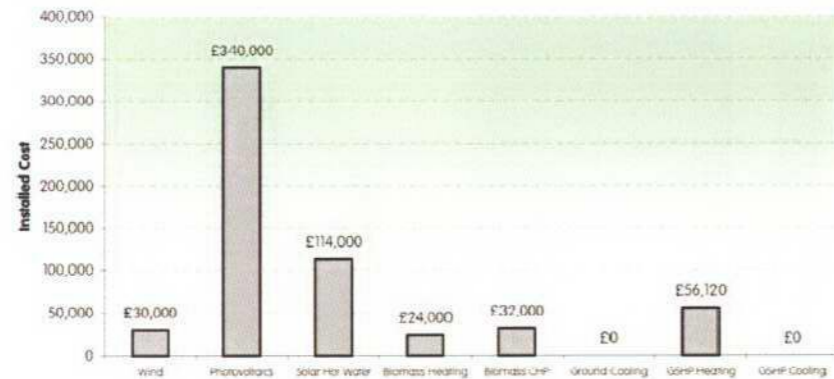
Calculation Sheet

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 Engineer: Caroline Stanton Date: 24th September 2007
 Checked By: Martin Lawless Date: 24th September 2007

33 SITE WIDE RENEWABLES IMPLEMENTATION - RENEWABLES COST EFFECTIVENESS

SUMMARY - PAYBACK PERIODS FOR EACH RENEWABLE COVERED

ID	Type	Carbon Saving		
		kgC/year	£	£/kgC
1	Wind	7.38%	30,000	12.41
2	Photovoltaics	10.08%	340,000	102.98
3	Solar Hot Water	6.34%	114,000	54.89
4	Biomass Heating	12.71%	24,000	5.76
5	Biomass CHP	26.48%	32,000	3.69
6	Ground Cooling	0.00%	0	0.00
7	Ground Source Heat Pump Heating	10.17%	56,120	16.85
8	Ground Source Heat Pump Cooling	0.00%	0	0.00



Calculation Sheet

Project: Waldegrave Arms, Teddington Job Number: 3066
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 Engineer: Caroline Stanton Date: 24th September 2007
 Checked By: Martin Lawless Date: 24th September 2007

34 SITE WIDE RENEWABLES IMPLEMENTATION - SUMMARY OF RECOMMENDATIONS

SUMMARY - SITE WIDE

ID	Area	Type	Recommendation	Carbon Emission Reduction	
				kgC/year	%
1	Building	Wind	NOT RECOMMENDED	2,418	7.38%
2	Building	Photovoltaics	NOT RECOMMENDED	0,000	0.00%
3	Building	Solar Hot Water	NOT RECOMMENDED	2,077	6.34%
4	Building	Biomass Heating	RECOMMENDED	4,164	12.71%
5	Building	Biomass CHP	NOT RECOMMENDED	8,675	26.48%
6	Building	Ground Cooling	NOT RECOMMENDED	0,000	0.00%
7	Building	Ground Source Heat Pump Heating	NOT RECOMMENDED	0,000	0.00%
8	Building	Ground Source Heat Pump Cooling	NOT RECOMMENDED	0,000	0.00%
				4,164	12.71%

NOT RECOMMENDED
 MANDATORY
 RECOMMENDED

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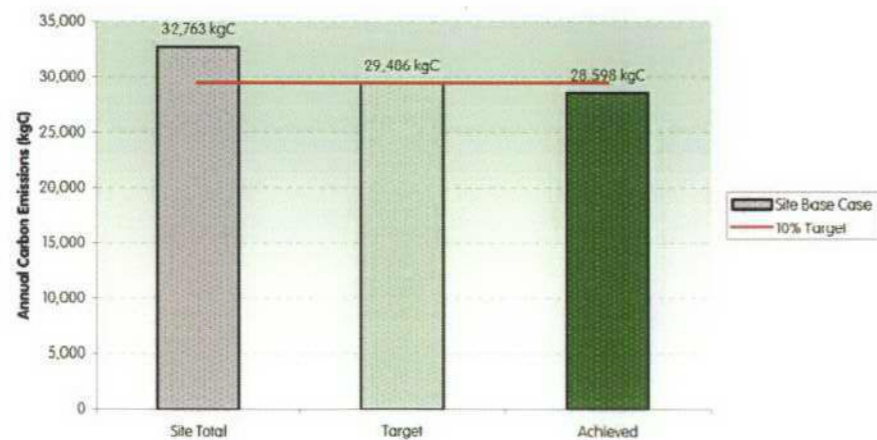
Calculation Sheet

Project: Waldegrave Arms, Teddington Job Number: 3066
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 Engineer: Caroline Stanton Date: 24th September 2007
 Checked By: Martin Lawless Date: 24th September 2007

35 SUMMARY OF DELIVERED ENERGY AND CARBON EMISSIONS - RENEWABLES CASE 1 OF 3

Fuel	Energy End Use	Base	Base	After	After	% saving	% saving
		kWh	kgC	kWh	kgC	kWh	kgC
Gas	Space Heating Gas	137,174	7,258				
	Hot Water Gas	53,356	2,823				
	Space Heating and Hot Water Gas	190,530	10,081				
	Other Gas	0	0				
Total Gas	190,530	10,081	98,477	5,210	48.31%	48.31%	
Electricity	Space Heating Electricity	0	0				
	Hot Water Electricity	0	0				
	Space Heating and Hot Water Electricity	0	0				
	Cooling/Refrigeration Electricity	56,273	6,476				
	Fans, Pumps, Controls and Other Electricity	0	0				
	Lighting	80,027	9,210				
	Appliances	28,219	3,248				
	Cooking	32,558	3,747				
	Total Electricity	197,078	22,682	197,078	22,682	0.00%	0.00%
Biomass	Space Heating Biomass						
	Water Heating Biomass						
	Electricity Biomass						
Total Biomass	0	0	103,560	706	100.00%	100.00%	
All Fuels		387,608	32,763	399,115	28,598	-2.97%	12.71%

SUMMARY GRAPH

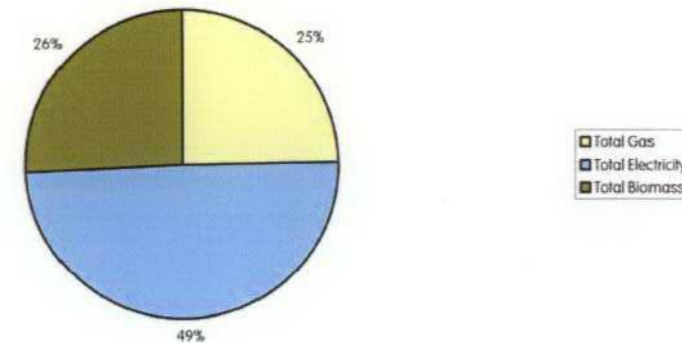


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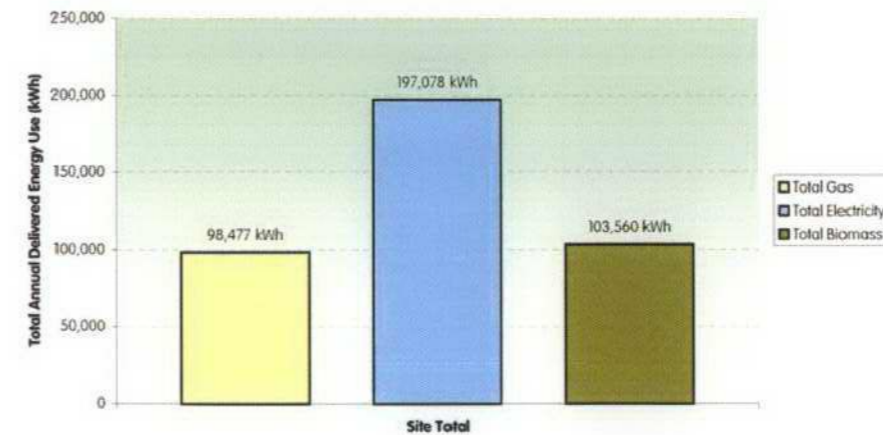
Project: Waldegrave Arms, Teddington Job Number: 3066
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 Checked By: Martin Lawless Date: 24th September 2007

36 SUMMARY OF DELIVERED ENERGY AND CARBON EMISSIONS - RENEWABLES CASE 2 OF 3

SUMMARY GRAPH - DELIVERED ENERGY BY FUEL TYPE RENEWABLES CASE APPLIED



SUMMARY GRAPH - CHANGE IN DELIVERED ENERGY BY FUEL TYPE RENEWABLES CASE APPLIED



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 RICHMOND UPON THAMES
 05 OCT 2007
 PLANNING

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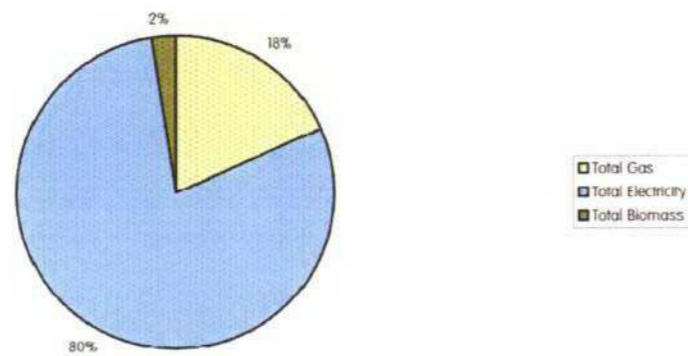
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Project: Waldegrave Arms, Teddington
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 Checked By: Martin Lawless

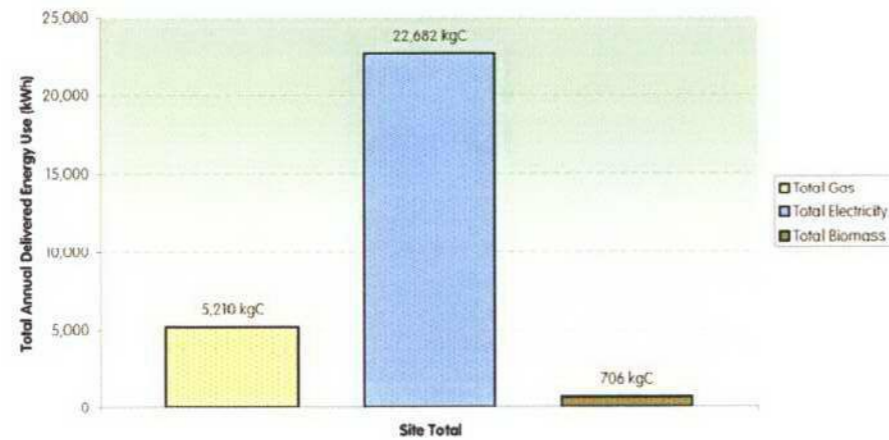
Job Number: 3066
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37 SUMMARY OF DELIVERED ENERGY AND CARBON EMISSIONS - RENEWABLES CASE 3 OF 3

SUMMARY GRAPH - CARBON EMISSIONS BY FUEL TYPE RENEWABLES CASE APPLIED



SUMMARY GRAPH - CARBON EMISSIONS BY FUEL TYPE RENEWABLES CASE APPLIED



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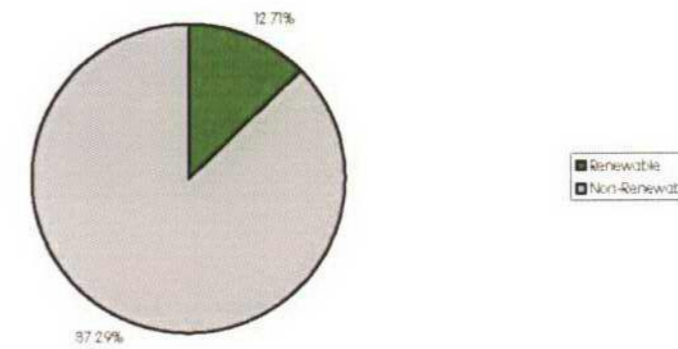
Calculation Sheet

Project: Waldegrave Arms, Teddington
 Subject: Renewable Energy Assessment
 Engineer: Caroline Stanton
 Checked By: Martin Lawless

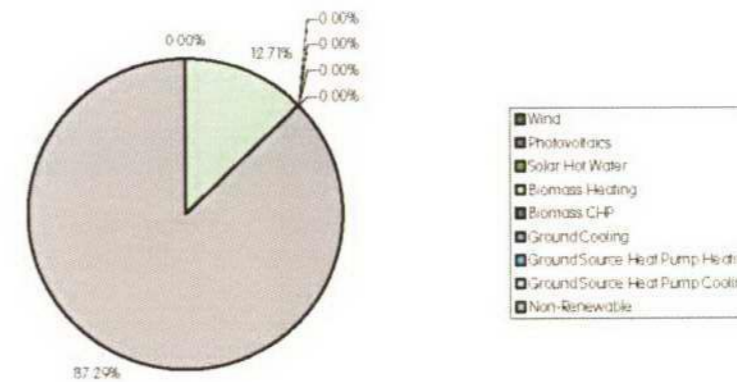
Job Number: 3066
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38 SUMMARY OF DELIVERED ENERGY AND CARBON EMISSIONS - RENEWABLES CASE 4 OF 4

SUMMARY GRAPH - PERCENTAGE RENEWABLE ENERGY SUMMARY



SUMMARY GRAPH - PERCENTAGE RENEWABLE ENERGY DETAIL



appendix d – renewables spreadsheets...

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Calculation Sheet

Project: Waldegrave Arms, Teddington
Subject: Renewable Energy Assessment
Engineer: Caroline Stanton
Checked By: Martin Lawless
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39 STANDARD CARBON EMISSION FACTORS

Fuel	CO ₂ emission factor kgCO ₂ /kWh	C emission factor kgC/kWh
Natural Gas	0.194	0.0529
LPG	0.234	0.0638
BioGas	0.025	0.0068
Oil	0.265	0.0723
Coal	0.291	0.0794
Anthracite	0.317	0.0865
Smokeless fuel (inc. coke)	0.392	0.1069
Dual fuel appliances (mineral + wood)	0.187	0.0510
Biomass	0.025	0.0068
Grid supplied Electricity	0.422	0.1151
Grid displaced Electricity	0.568	0.0000
Waste heat	0.018	0.0049

NOTES

1. Based on Part L1(2006) Carbon Emission Factors
2. Carbon Emission factors used for Renewable Energy Assessment percentage calculations.

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Calculation Sheet

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Subject: Renewable Energy Assessment
Engineer: Caroline Stanton
Checked By: Martin Lawless
Job Number: 3066
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Date: 24th September 2007

40 STANDARD ENERGY COSTS

Fuel	Energy Cost p/kWh	
Natural Gas	1.63	1.6300
LPG		
BioGas		
Oil		
Coal		
Anthracite		
Smokeless fuel (inc. coke)		
Dual fuel appliances (mineral + wood)		
Biomass	3.00	
Grid supplied Electricity	3.65	
Grid displaced Electricity		
Waste heat		
Wood Chip	2.1	
Wood Pellets	3.5	



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3066 planning 02.10.07



MTT/SUSTAIN
9 KINGSWAY
LONDON WC2B 6XF

T +44(0)20 7836 1133
F +44(0)20 7836 1153

E info@mttsustain.com
W mttsustain.com