

How Much Biogenic Energy Comes from EfW?

Based on Table 5: Data set and calculations for the energy recovery half of the model
From Defra's "Energy recovery for residual waste: A carbon based modelling approach", February 2014

The original table is bounded by the thick-bordered box.
All other work is original

Table 1: Results Using Composition Quoted in the Report (attributed to 'Carbon Balances' (ERM 2006) Table A.61)

Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)					
	Prop. 11	Caloric value MWh/t	Efficiency	Energy potential MWh = (1)x(2)x(3)	Prop. biogenic C	Mass of biogenic C = (1)x(5)	Mass of biogenic CO ₂ released = (6)x44/12	Prop. fossil C	Mass of fossil C = (1)x(8)	Mass of fossil CO ₂ released = (9)x44/12	Fossil CO ₂ from CCGT offset = (4)x0.373	Net fossil CO ₂ from EfW = (10)-(11)	% of total energy potential = (4)/sum of (4)	% biogenic carbon = (4)x(5)/((5)+(8))	Implied biogenic energy potential = (4)x(14)	Proportion of biogenic energy potential = (15)/sum of (15)	% fossil carbon = (4)x(8)/((5)+(8))	Implied fossil energy potential = (4)x(17)	Proportion of fossil energy potential = (18)/sum of (18)					
Mixed Paper and Card	15%	3.5	*1.00	0.54	0.32	0.05	0.18	0	0	0	0	0.2	-0.2	19.4%	100%	0.54	34.2%	0%	0	0.0%				
Plastics	13%	7.05	*1.00	0.88	0	0	0	0.52	0.07	0.24	0.33	-0.09	31.5%	0%	0	0.0%	100%	0.88	73.9%					
Textiles (and footwear)	4%	4.44	*1.00	0.2	0.2	0.01	0.03	0.2	0.01	0.03	0.07	-0.04	7.2%	50%	0.1	6.3%	50%	0.10	8.4%					
Miscellaneous combustibles	6%	4.33	*1.00	0.27	0.19	0.01	0.04	0.19	0.01	0.04	0.1	-0.06	9.7%	50%	0.14	8.6%	50%	0.14	11.3%					
Miscellaneous non-combustibles	9%	0.78	*1.00	0.07	0.04	0	0.01	0.04	0	0.01	0.03	-0.01	2.5%	50%	0.04	2.2%	50%	0.04	2.9%					
Food	31%	1.47	*1.00	0.45	0.14	0.04	0.16	0	0	0	0.17	-0.17	16.1%	100%	0.45	28.5%	0%	0	0.0%					
Garden	3%	1.81	*1.00	0.05	0.17	0.01	0.02	0	0	0.02	-0.02	-0.02	0%	100%	0.05	3.2%	0%	0	0.0%					
Soil and other organic waste	3%	1.33	*1.00	0.05	0.07	0	0.01	0	0	0.02	-0.02	-0.02	1.8%	100%	0.05	3.2%	0%	0	0.0%					
Glass	5%	0.42	*1.00	0.02	0	0	0	0	0	0.01	-0.01	-0.01	0%	0%	0	0.0%	0%	0	0.0%					
Metals, Other Non-biodeg	2%	0	*1.00	0	0	0	0	0	0	0	0	0	0.0%	0%	0	0.0%	0%	0	0.0%					
Non-organic fines	1%	1.33	*1.00	0.02	0	0	0	0.07	0	0	0.01	0	0.0%	0%	0	0.0%	100%	0.02	1.7%					
Wood	3%	5.08	*1.00	0.14	0.44	0.01	0.04	0	0	0	0.05	-0.05	5.0%	100%	0.14	8.9%	0%	0	0.0%					
Sanitary / disp nappies	4%	2.22	*1.00	0.1	0.15	0.01	0.02	0.04	0	0.01	0.04	-0.03	3.6%	79%	0.08	5.0%	21%	0.02	1.8%					
Total	100%			2.79		0.14	0.52		0.09	0.34	1.04	-0.7			1.58			43.0%						
Total ex glass (counted neither as biogenic nor fossil)				2.77																				
													Total biogenic contribution			57.0%			Total fossil contribution			43.0%		

*efficiency is included to be a potential variable in the calculation. It is set at the hypothetical value of 1 by default for the purpose of setting up the model, however, this is not intended to represent a realistic maximum for the actual value attainable.
note: results vary slightly from original table due to calculating based on rounded published figures

Table 2: Results Using Resource Futures's 2011 Kerbside Collected Residual Waste Composition

Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)					
	Prop. 11	Caloric value MWh/t	Efficiency	Energy potential MWh = (1)x(2)x(3)	Prop. biogenic C	Mass of biogenic C = (1)x(5)	Mass of biogenic CO ₂ released = (6)x44/12	Prop. fossil C	Mass of fossil C = (1)x(8)	Mass of fossil CO ₂ released = (9)x44/12	Fossil CO ₂ from CCGT offset = (4)x0.373	Net fossil CO ₂ from EfW = (10)-(11)	% of total energy potential = (4)/sum of (4)	% biogenic carbon = (4)x(5)/((5)+(8))	Implied biogenic energy potential = (4)x(14)	Proportion of biogenic energy potential = (15)/sum of (15)	% fossil carbon = (4)x(8)/((5)+(8))	Implied fossil energy potential = (4)x(17)	Proportion of fossil energy potential = (18)/sum of (18)					
Mixed Paper and Card	12%	3.5	*1.00	0.43	0.32	0.04	0.14	0	0	0	0.16	-0.16	12.8%	100%	0.43	33.2%	0%	0	0.0%					
Plastics	25%	7.05	*1.00	1.78	0	0	0	0.52	0.13	0.48	0.66	-0.18	53.1%	0%	0	0.0%	100%	1.78	87.3%					
Textiles (and footwear)	3%	4.44	*1.00	0.15	0.2	0.01	0.03	0.2	0.01	0.03	0.06	-0.03	4.6%	50%	0.08	5.9%	50%	0.08	3.8%					
Miscellaneous combustibles	6%	4.33	*1.00	0.24	0.19	0.01	0.04	0.19	0.01	0.04	0.09	-0.05	7.1%	50%	0.12	9.3%	50%	0.12	5.9%					
Miscellaneous non-combustibles	2%	0.78	*1.00	0.02	0.04	0.00	0.00	0.04	0.00	0.00	0.01	0.00	0.5%	50%	0.01	0.7%	50%	0.01	0.4%					
Food	26%	1.47	*1.00	0.39	0.14	0.04	0.13	0	0	0	0.14	-0.14	11.5%	100%	0.39	29.8%	0%	0	0.0%					
Garden	3%	1.81	*1.00	0.05	0.17	0.00	0.02	0	0	0	0.02	-0.02	1.5%	100%	0.05	3.9%	0%	0	0.0%					
Soil and other organic waste	5%	1.33	*1.00	0.07	0.07	0.00	0.01	0	0	0	0.02	-0.02	2.0%	100%	0.07	5.2%	0%	0	0.0%					
Glass	6%	0.42	*1.00	0.02	0	0	0	0	0	0	0.01	-0.01	0.7%	0%	0	0.0%	0%	0	0.0%					
Metals, Other Non-biodeg	3%	0	*1.00	0.00	0	0	0	0	0	0	0	0	0.0%	0%	0	0.0%	0%	0	0.0%					
Non-organic fines	2%	1.33	*1.00	0.03	0	0	0	0.07	0.00	0.00	0.01	0.00	0.8%	0%	0	0.0%	100%	0.03	1.3%					
Wood	1%	5.08	*1.00	0.06	0.44	0.005	0.018	0	0	0	0.020626543	-0.02	1.6%	100%	0.06	4.3%	0%	0	0.0%					
Sanitary / disp nappies	6%	2.22	*1.00	0.13	0.15	0.009	0.032	0.04	0.00	0.01	0.05	-0.04	3.8%	79%	0.10	7.8%	21%	0.03	1.3%					
Total	100%			3.35		0.116	0.425		0.15	0.56	1.25	-0.69			1.29			61.2%						
Total ex glass (counted neither as biogenic nor fossil)				3.33																				
													Total biogenic contribution			38.6%			Total fossil contribution			61.2%		

note: The categories used in the Resource Futures report have been allocated to the most appropriate of the categories available in the table