Description of Functional Unit: Combined Heat and Power Generation by the Combustion of High Biomass Refuse Derived Fuel
Final Unit of Measurement: 1 MWhe Electricity (net) or Heat

A
Municipal Solid Waste (MSW) = 11.128 tonnes
Moisture Content = 15 %

PRE-TREATMENT
(dry and wet MSW)

B
MSW (wet, shredded & sized <150mm) = 14.552 tonnes
Moisture Content = 35 %

FAIRPORT PROCESSOR

C
MSW (dry, shredded & sized <50mm) = 6.148 tonnes
Moisture Content = 16 %
Price of Processed MSW = 24 £/tonne

DENSITY SEPARATOR

D
MSW (dry, shredded & sized 5mm, 5-16mm, 16-50mm) = 5.841 tonnes
Moisture Content = 16 %
Price of Separated MSW = 25 £/tonne

PELLETISATION

E
STORED REFUSE DERIVED FUEL
Net Calorific Value = 12.663 MJ/kg
Moisture Content of Refuse Derived Fuel = 16 % by weight
Ash Content of Refuse Derived Fuel = 13.3 % by weight
Losses = 2 % by weight
Available Refuse Derived Fuel = 5.724 tonnes

I
REFERENCE TRANSPORT TO LANDFILL WITH ENERGY RECOVERY
Road Transport Round Trip Distance = 100 kilometres

J
Municipal Solid Waste to Landfill with Energy Recovery?
1 = yes, 0 = no

K
Percentage of Recyclates by Weight = 20 %
Amount of Recyclates = 2.910 tonnes
Price of Recyclates = 20 £/tonne

O
Percentage of By-products by Weight = 5 %
Amount of By-products by Weight = 0.307 tonnes
Price of By-Products = 20 £/tonne

L
Percentage of Inert Landfill Material by Weight = 15 %
Amount of Landfill Material = 2.183 tonnes

M
ROAD TRANSPORT TO LANDFILL DISPOSAL
Road Transport Round Trip Distance = 100 kilometres

N
Disposed Inert Material = 2.183 tonnes

F

TRANSPORT TO PLANT
(one mode only)

Road Transport Round Trip Distance =	100	kilometres
Rail Transport Round Trip Distance =	0	kilometres
Barge Transport Round Trip Distance =	0	kilometres
Ship Transport Round Trip Distance =	0	kilometres
Losses =	3	%

Pellets =	5.552	tonnes
Moisture Content =	16	%

G

COMBUSTION AND COMBINED HEAT AND POWER GENERATION

Thermal Input Rating of Plant =	66	MWt
Thermal Efficiency of Plant =	26	%
Ratio of Heat to Power Output =	4	
Net Electrical Output Rating of Plant =	3	MWe
Thermal Output Rating of Plant =	14	MWt
Weighting of Value of Electricity to Value of Heat =	2	
Load Factor of Plant =	55	%
Life of Plant =	25	Years
Number of Start Up Operations per Year =	4	
Natural Gas for Start Up =	14.4	GJ/start-up
Waste Incineration Directive Compliance =	1	1 =Yes, 0 = No

Electricity =	1	MWhe
Heat =	4	MWht
Ash =	0.879	tonnes

H

TRANSPORT TO ASH DISPOSAL POINT

Road Transport Round Trip Distance =	100	kilometres

REPLACEMENT BY ASH OF AGRICULTURAL LIME?

	1	1 = Yes, 0 = No

A	Default moisture content of 15% (Ref. 13)
B	Default moisture content of 35% (Ref. 13)
C	Default moisture content of 15.7% (Ref. 13), and a default value price of £24/t MSW based on shadow price derived from RO penalty price of £30/MWhe, calorific value of 12.712 MJ/kg for RDF pellets and a thermal efficiency of electricity generation by combustion of 25%, giving a conversion factor for dried, shredded and sized MSW (16% moisture content) of 1.133 tonnes/MWhe.
D	Default value price of £25/t MSW based on shadow price derived from RO penalty price of £30/MWhe, calorific value of 12.712 MJ/kg for MSW and a thermal efficiency of electricity generation by combustion of 25%, giving a conversion factor for dried, shredded, sized and separated of 1.192 tonnes/MWhe.
E	Default moisture content of pellets of 15.7% (Ref. 13), default ash content of pellets of 13.3% (Ref. 13), nominal losses of 2% and the net calorific value (NCV) is calculated assuming a dry NCV of 18.7 and a hydrogen content of 4.34 (Ref. 16)
F	Default assumes a nominal round trip distance by road of 100 kilometres and 3% losses
G	Default values for thermal efficiency of 75%, a net electrical output rating of 2 MWe and a thermal output rating of 6 MWt calculated from specified thermal input rating, thermal efficiency of power plant and a heat to power ratio of 2, a thermal input rating of power plant of 10 MWt, a load factor of 55% (Ref. 3), a plant life of 25 years (Ref. 3), start-up fuel of 14.4 GJ/operation based on 20% of load (10 MWt) for 5 mins and a nominal 6 start up operations per year (Ref. 19).
H	Default assumes a nominal round trip distance by road of 100 kilometres and 3% losses
I	Default assumes a nominal round trip distance by road of 100 kilometres and 3% losses
J	Default assumes disposal to landfill with energy recovery
K	Default value for recyclates amounts to 20% of MSW by weight (Ref. 13) and an average price for general materials recovered for recycling of £20/tonne (Ref. 20)
L	Default value for landfill material amounts to 15% of MSW by weight (Ref. 13)
M	Default assumes a nominal round trip distance by road of 100 kilometres
N	Default assumes that, as all biomass has been recovered previously, this material is, effectively, inert and, hence, there is no energy recovery in landfill
O	Default value of by products of 5% by weight (Ref. 13) and an average price for general materials recovered for recycling of £20/tonne (Ref. 20)