Appendix A Detailed Technology Assessment

BAT Consideration	Moving Grate	Fluidised Bed	Rotary Kiln Pyrolysis (Wastegen System)	Tube Pyrolysis (Compact System)	Gasification
Operational Considerations					
Conversion Efficiency (%)	83	83	-	75	-
Generation Efficiency (%)	31	31	-	22	-
Overall Gross Efficiency (%)	26	26	-	16	-
Site Power Use (%)	12	12	-	14	-
Overall Net efficiency (%)	23	23	20 – 25	14	14 – 24%
Emissions Control	▪ SNCR or SCR ▪ Spray absorber ▪ Fabric filter ▪ Lime injection ▪ PAC injection	▪ SNCR or SCR ▪ Spray absorber ▪ Fabric filter ▪ Lime injection ▪ PAC injection	▪ Lime in feed ▪ SNCR ▪ Fabric filter ▪ PAC injection ▪ Sodium bicarbonate injection	▪ Bag filter ▪ Sodium bicarbonate injection ▪ SCR with ammonia or SNCR	▪ Depends on system chosen.
Site Considerations					
Available Space/Location	▪ Typically 2.5 - 3.5 ha	▪ Typically 2.5 - 3.5 ha	▪ Typically 1.5 - 4 ha	▪ Typically 1.5 - 4 ha	▪ Typically 0.5 - 6 ha
Staffing	▪ 30 -55 persons for plants ranging 250,000 – 450,000 tpa	▪ 30 -55 persons for plants ranging 250,000 – 450,000 tpa	▪ 30 – 40 persons for plants up to 250,00tpa	▪ 30 – 40 persons for plants up to 250,00tpa	▪ 30 – 40 persons for plants up to 250,00tpa
Environmental Impact					
Emissions to air					
Dust	<1	<1	1	2	0.01 -2
Sulphur dioxide	20	20	20	<1	1 – 30
Oxides of nitrogen	<200	<200	167	<37	37 – 167
Carbon monoxide	<5	<5	<10	<2	0.1 – 10
Dioxins & furans	0.03	0.03	0.001	<0.003	0.0009 – 0.03
HCl	7	7	5	2	1.2 – 5
HF	<0.2	<0.2	Below detection	<0.1	0.008 – 0.15
TOC	<3	<3	1.6	1	1 – 1.6
Hg	0.004	0.004	0.011	0.006	0.0001 – 0.01
Cd & Tl	<0.001	<0.001	0.006	0.006	0.0002 – 0.006
Metals	<0.2	<0.2	0.054	0.006	0.006 – 0.054
Emissions to water	Depends on boiler water treatment and cooling	Depends on boiler water treatment and cooling	Depends on boiler water treatment and cooling	Depends on boiler water treatment and cooling	Depends on boiler water treatment and cooling
Noise and vibration	Can be controlled with appropriate abatement	Can be controlled with appropriate abatement – due to re-treatment more abatement may be needed	Can be controlled with appropriate abatement – due to re-treatment more abatement may be needed	Can be controlled with appropriate abatement – due to re-treatment more abatement may be needed	Can be controlled with appropriate abatement – due to re-treatment more abatement may be needed
Odour	Typically avoids nuisance	Typically avoids nuisance – pre-treatment creates more air movement that may need	Typically avoids nuisance – pre-treatment creates more air movement that may need	Typically avoids nuisance – pre-treatment creates more air movement that may need	Typically avoids nuisance – pre-treatment creates more air movement that may need

BAT Consideration	Moving Grate	Fluidised Bed	Rotary Kiln Pyrolysis (Wastegen System)	Tube Pyrolysis (Compact System)	Gasification
		additional consideration	additional consideration	additional consideration	additional consideration
Visual impact	▪ Stack height dependant on the location/technology ▪ Typical building height is 40m	▪ Stack height dependant on the location/technology ▪ Typical building height is 40m	▪ Stack height dependant on the location/technology ▪ Typical building height can be reduced to around 15m if CHP engine used	▪ Stack height dependant on the location/technology ▪ Typical building height can be reduced to around 15m if CHP engine used	▪ Stack height dependant on the location/technology ▪ Typical building height can be reduced to around 15m if CHP engine used
Residue Generation	▪ Bottom ash (200 – 300 kg/te) ▪ APC residues (30 – 60 kg/Te) Hazardous	▪ Pre-treatment may produce residue for disposal/recycling ▪ Bottom ash (200 – 300 kg/te) ▪ APC residues which may be higher than moving grate due to ash carry over.	▪ Pre-treatment may produce residue for disposal/recycling ▪ Slag (200 – 300 kg/te) ▪ APC residue (~20 – 50 kg/Te)	▪ Pre-treatment may produce residue for disposal/recycling ▪ Slag (200 – 300 kg/te) ▪ APC residue (~20 - 50 kg/Te)	▪ Pre-treatment may produce residue for disposal/recycling ▪ Bottom ash (200 – 300 kg/te) ▪ APC residue (~20 – 50 kg/Te)
Economic Considerations For 200,000 tpa Plant[(1)]					
Capital Cost	~ £50 – 64m	~ £50 – 64m	~ £19 – 93m	~ £19 – 93m	~ £19 – 93m
Operating Cost	~ £30 – £45/tonne	~ £30 – £45/tonne	~ £35 – £45/tonne	~ £35 – £46/tonne	~ £35 – £46/tonne
Environmental Benefit					
Energy Recovery	Power generated from waste is not considered renewable unless accepted as a good quality CHP, then the biomass fraction becomes eligible.	Power generated from waste is not considered renewable unless accepted as a good quality CHP, then the biomass fraction becomes eligible.	If accredited as advanced thermal technology the power generated from the biomass fraction is eligible for support under ROCs	If accredited as advanced thermal technology the power generated from the biomass fraction is eligible for support under ROCs	If accredited as advanced thermal technology the power generated from the biomass fraction is eligible for support under ROCs
Product Recovery	▪ Potential for bottom ash to be recycled	▪ Potential for bottom ash to be recycled ▪ May recover other materials during pre-treatment	▪ Potential for bottom ash to be recycled ▪ May recover other materials during pre-treatment	▪ Potential for bottom ash to be recycled ▪ May recover other materials during pre-treatment	▪ Potential for bottom ash to be recycled ▪ May recover other materials during pre-treatment

(1) Costs taken from “An Introduction To Waste Technologies”, 2008 Edition, Waste Technologies UK Associates.