

APPENDIX D

AIR EMISSIONS DATA

**Low Speed Diesel 30MW
Stage 1**

**Table 1
Appendix D**

FUEL AND CONVERSION TECHNOLOGIES											EXTENSIVE PARAMETERS			
key	tipo	C % *	H % *	O % *	N % *	S % *	Ash % *	H2O %	GHV BTU/lb	F _{dry} MMBTU	F _{wet} MMBTU	Gross output, MW	30.000	
a	gas natural	72	23.8	1.32	2.8	0.0006	0	0	22000	8325	10271	Consumption, kg/hr	5494.7	
b	distillate diesel	86.08	13.56	0	0.04	0.2	0	0	19000	8885	10168	Exhaust, m3/s actual	118.917	
c	Bunker 1.8% S	86.5	11.2	0	0.3	1.8	0	0.2	18800	8633	9706	Gas velocity, m/s	30	
d	Orimulsion 2.85% S	60	7.5	0	0	2.85	0.12	29	12984	8663	10139	Exhaust diameter, m	2.247	
e	coal 1% S	78.8	5.2	6.9	1.6	1	6.8	12	12283	9125	9984	Cooling, MMBTU/hr	69.853	
f	wood green	40.0	8.0	50.0	0	0.0008	2	50	3500	8961	13811	PM, g/s	1.868	
A	combustion turbine single cycle	Reference temperature °C									0	Nox ^{***} , g/s	109.464	
B	combined cycle	Mol volume at reference temperature, m3									0.0224	SO ₂ , g/s	76.040	
C	internal combustion engine, single cycle											CO, g/s	3.443	
D	steam cycle	* dry base percentages for solid fuels										CO ₂ , g/s	5251.090	
												SO ₂ , Mg/MW-day	0.219	

GENERAL CHARACTERISTICS																
key	select a case	Uncontrolled emission factors (lb/MMBTU)						H2O	Efficiency %	Consumption			Exhaust Gases			Cooling BTU/kwh
		PM **	PM10 **	Nox*** **	SO ₂	CO **	CO ₂			BTU/kwh	g/kwh	O ₂ % dry	Deg. °C	Sm ³ /kwh	Am ³ /kwh	
aA	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	35	9751	201	15	565	8.1	26.6	0
aB	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	55	6205	128	15	120	5.2	8.0	2553
bA	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	35	9751	233	15	565	8.7	27.8	0
bB	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	55	6205	148	15	120	5.5	8.3	2482
bC	0	0.1	0.05	3.20	0.21	0.850	166	64	45	7584	181	13	342	5.0	12.0	2328
cC	1	0.21	0.151	5.78	2.65	0.120	183	54	45	7584	183	15	300	6.6	14.3	2328
dC	0	0.145	0.104	2.89	4.39	0.200	169	74	45	7584	265	13	300	4.9	9.7	2328
aD	0	1.8E-03	9.0E-04	0.27	5.5E-04	0.080	120	97	35	9751	201	3	120	2.7	4.6	3169
bD	0	0.01	0.01	0.17	0.21	0.036	166	64	35	9751	233	3	120	2.9	4.6	3169
cD	0	0.13	0.09	0.31	1.91	0.033	169	54	35	9751	235	3	120	2.8	4.4	3169
dD	0	0.20	0.14	0.24	4.39	0.033	169	74	35	9751	341	3	130	2.8	4.7	3169
eD	0	2.77	1.02	0.90	1.63	0.020	206	43	35	9751	360	3	150	2.9	4.9	3169
fD	0	0.40	0.36	0.49	0.00	0.600	210	246	30	11377	1476	6	150	4.0	8.7	3982

EMISSION CONTROL														SPREADSHEET EMISSIONS FROM THERMAL POWER		
key	Uncontrolled Emissions (g/kwh)							Minimum Control **** (%)							area to enter extensive data	area to enter intensive data
	PM	PM10	Nox***	SO ₂	CO	CO ₂	H ₂ O	PM	PM10	Nox***	SO ₂	CO	CO ₂			
	0.01	0.00	1.42	0.00	0.36	531	431	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0.01	0.00	0.90	0.00	0.23	338	274	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0.02	0.01	3.90	0.93	0.01	735	284	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0.01	0.01	2.48	0.59	0.01	468	181	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0.34	0.17	11.02	0.72	2.93	572	221	0%	0%	0%	0%	0%	0%	0%	0%	0%
cC	0.72	0.52	19.90	9.12	0.41	630	185	69%	69%	34%	0%	0%	0%	0%	0%	0%
	0.50	0.36	9.94	15.12	0.69	583	256	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0.01	0.00	1.18	0.00	0.35	531	431	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0.06	0.04	0.76	0.93	0.16	735	284	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0.58	0.41	1.39	8.48	0.15	747	237	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0.87	0.62	1.04	19.44	0.15	750	329	0%	0%	0%	0%	0%	0%	0%	0%	0%
	12.25	4.53	3.96	7.21	0.09	914	191	0.0%	0.0%	0%	0%	0%	0%	0%	0%	0%
	2.07	1.86	2.53	0.02	3.10	1082	1269	0%	0%	0%	0%	0%	0%	0%	0%	0%

INTENSIVE PARAMETERS																	
key	Actual Emissions (g/kwh)						Stack Gas Concentraciones (dry reference conditions)										
	PM g/kwh	PM10 g/kwh	Nox*** g/kwh	SO ₂ g/kwh	CO g/kwh	CO ₂ g/kwh	PM mg/m3	PM10 mg/m3	Nox*** mg/m3	SO ₂ mg/m3	CO mg/m3	CO ₂ %	Nox ppm	SO ₂ ppm	CO ppm	H ₂ O %	
	0.01	0.00	1.42	0.00	0.36	531	1	1	174	0	45	3.3	89	0	36	6.2	
	0.01	0.00	0.90	0.00	0.23	338	1	1	174	0	45	3.3	89	0	36	6.2	
	0.02	0.01	3.90	0.93	0.01	735	2	1	448	107	2	4.3	228	38	1	3.9	
	0.01	0.01	2.48	0.59	0.01	468	2	1	448	107	2	4.3	228	38	1	3.9	
	0.34	0.17	11.02	0.72	2.93	572	68	34	2182	144	580	5.8	1111	50	464	5.2	
cC	0.22	0.16	13.14	9.12	0.41	630	34	25	2000	1389	63	4.9	1018	486	50	3.4	
	0.50	0.36	9.94	15.12	0.69	583	101	73	2020	3071	140	6.0	1028	1075	112	6.9	
	0.01	0.00	1.18	0.00	0.35	531	3	1	440	1	132	10.1	224	0	106	16.6	
	0.06	0.04	0.76	0.93	0.16	735	22	16	265	325	55	13.1	135	114	44	11.0	
	0.58	0.41	1.39	8.48	0.15	747	210	149	498	3046	53	13.7	254	1066	42	9.6	
	0.87	0.62	1.04	19.44	0.15	750	311	221	372	6958	53	13.7	190	2435	42	12.8	
	12.254	4.534	3.965	7.208	0.090	914	4165	1541	1347	2450	31	15.8	686	857	24	7.5	
	2.07	1.86	2.53	0.02	3.10	1082	510	459	625	6	765	13.6	318	2	612	28.1	

**Low Speed Diesel 40MW
Stage 2**

**Table 1 (cont.)
Appendix D**

FUEL AND CONVERSION TECHNOLOGIES

EXTENSIVE PARAMETERS

key	tipo	C % *	H % *	O % *	N % *	S % *	Ash % *	H2O %	GHV BTU lb	F _{dry} ft ³ MMBTU	F _{wet} ft ³ MMBTU	Gross output, MW	40.000	
a	gas natural	72	23.8	1.32	2.8	0.0006	0	0	22000	8325	10271	Consumption, kg/hr	7326.3	
b	distillate diesel	86.08	13.56	0	0.04	0.2	0	0	19000	8885	10168	Exhaust, m3/s actual	158.556	
c	Bunker 1.8% S	86.5	11.2	0	0.3	1.8	0	0.2	18800	8633	9706	Gas velocity, m/s	30	
d	Orimulsion 2.85% S	60	7.5	0	0	2.85	0.12	29	12984	8663	10139	Exhaust diameter, m	2.594	
e	coal 1% S	78.8	5.2	6.9	1.6	1	6.8	12	12283	9125	9984	Cooling, MMBTU/hr	93.137	
f	wood green	40.0	8.0	50.0	0	0.0008	2	50	3500	8961	13811	PM, g/s	2.491	
A	combustion turbine single cycle	Reference temperature °C									0	Nox ^{***} , g/s	145.952	
B	combined cycle	Mol volume at reference temperature, m3									0.0224	SO ₂ , g/s	101.387	
C	internal combustion engine, single cycle	* dry base percentages for solid fuels											CO, g/s	4.591
D	steam cycle												CO ₂ , g/s	7001.453
												SO ₂ , Mg/MW-day	0.219	

GENERAL CHARACTERISTICS

key	select a case	Uncontrolled emission factors (lb/MMBTU)							Efficiency %	Consumption		Exhaust Gases				Cooling BTU kwh
		PM **	PM10 **	Nox ^{***} **	SO ₂	CO **	CO ₂	H ₂ O		BTU kwh	g kwh	O ₂ dry	Deg. °C	Sm ₃ kwh	Am ₃ kwh	
aA	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	35	9751	201	15	565	8.1	26.6	0
aB	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	55	6205	128	15	120	5.2	8.0	2553
bA	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	35	9751	233	15	565	8.7	27.8	0
bB	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	55	6205	148	15	120	5.5	8.3	2482
bC	0	0.1	0.05	3.20	0.21	0.850	166	64	45	7584	181	13	342	5.0	12.0	2328
cC	1	0.21	0.151	5.78	2.65	0.120	183	54	45	7584	183	15	300	6.6	14.3	2328
dC	0	0.145	0.104	2.89	4.39	0.200	169	74	45	7584	265	13	300	4.9	9.7	2328
aD	0	1.8E-03	9.0E-04	0.27	5.5E-04	0.080	120	97	35	9751	201	3	120	2.7	4.6	3169
bD	0	0.01	0.01	0.17	0.21	0.036	166	64	35	9751	233	3	120	2.9	4.6	3169
cD	0	0.13	0.09	0.31	1.91	0.033	169	54	35	9751	235	3	120	2.8	4.4	3169
dD	0	0.20	0.14	0.24	4.39	0.033	169	74	35	9751	341	3	130	2.8	4.7	3169
eD	0	2.77	1.02	0.90	1.63	0.020	206	43	35	9751	360	3	150	2.9	4.9	3169
fD	0	0.40	0.36	0.49	0.00	0.600	210	246	30	11377	1476	6	150	4.0	8.7	3982

EMISSION CONTROL

** US EPA AP-42 or vendor warranties

key	Uncontrolled EmissionsI (g/kwh)							Minimum Control **** (%)					SPREADSHEET EMISSIONS FROM THERMAL POWER area to enter extensive data area to enter intensive data
	PM	PM10	Nox ^{***}	SO ₂	CO	CO ₂	H ₂ O	PM	PM10	Nox ^{***}	SO ₂	CO	
	0.01	0.00	1.42	0.00	0.36	531	431	0%	0%	0%	0%	0%	0%
	0.01	0.00	0.90	0.00	0.23	338	274	0%	0%	0%	0%	0%	0%
	0.02	0.01	3.90	0.93	0.01	735	284	0%	0%	0%	0%	0%	0%
	0.01	0.01	2.48	0.59	0.01	468	181	0%	0%	0%	0%	0%	0%
	0.34	0.17	11.02	0.72	2.93	572	221	0%	0%	0%	0%	0%	0%
cC	0.72	0.52	19.90	9.12	0.41	630	185	69%	69%	34%	0%	0%	0%
	0.50	0.36	9.94	15.12	0.69	583	256	0%	0%	0%	0%	0%	0%
	0.01	0.00	1.18	0.00	0.35	531	431	0%	0%	0%	0%	0%	0%
	0.06	0.04	0.76	0.93	0.16	735	284	0%	0%	0%	0%	0%	0%
	0.58	0.41	1.39	8.48	0.15	747	237	0%	0%	0%	0%	0%	0%
	0.87	0.62	1.04	19.44	0.15	750	329	0%	0%	0%	0%	0%	0%
	12.25	4.53	3.96	7.21	0.09	914	191	0.0%	0.0%	0%	0%	0%	0%
	2.07	1.86	2.53	0.02	3.10	1082	1269	0%	0%	0%	0%	0%	0%

*** Nox as NO₂

INTENSIVE PARAMETERS

**** to meet World Bank guidelines

key	Actual Emissions (g/kwh)						Stack Gas Concentraciones (dry reference conditions)									
	PM g/kwh	PM10 g/kwh	Nox ^{***} g/kwh	SO ₂ g/kwh	CO g/kwh	CO ₂ g/kwh	PM mg/m3	PM10 mg/m3	Nox ^{***} mg/m3	SO ₂ mg/m3	CO mg/m3	CO ₂ %	Nox ppm	SO ₂ ppm	CO ppm	H ₂ O %
	0.01	0.00	1.42	0.00	0.36	531	1	1	174	0	45	3.3	89	0	36	6.2
	0.01	0.00	0.90	0.00	0.23	338	1	1	174	0	45	3.3	89	0	36	6.2
	0.02	0.01	3.90	0.93	0.01	735	2	1	448	107	2	4.3	228	38	1	3.9
	0.01	0.01	2.48	0.59	0.01	468	2	1	448	107	2	4.3	228	38	1	3.9
	0.34	0.17	11.02	0.72	2.93	572	68	34	2182	144	580	5.8	1111	50	464	5.2
cC	0.22	0.16	13.14	9.12	0.41	630	34	25	2000	1389	63	4.9	1018	486	50	3.4
	0.50	0.36	9.94	15.12	0.69	583	101	73	2020	3071	140	6.0	1028	1075	112	6.9
	0.01	0.00	1.18	0.00	0.35	531	3	1	440	1	132	10.1	224	0	106	16.6
	0.06	0.04	0.76	0.93	0.16	735	22	16	265	325	55	13.1	135	114	44	11.0
	0.58	0.41	1.39	8.48	0.15	747	210	149	498	3046	53	13.7	254	1066	42	9.6
	0.87	0.62	1.04	19.44	0.15	750	311	221	372	6958	53	13.7	190	2435	42	12.8
	12.254	4.534	3.965	7.208	0.090	914	4165	1541	1347	2450	31	15.8	686	857	24	7.5
	2.07	1.86	2.53	0.02	3.10	1082	510	459	625	6	765	13.6	318	2	612	28.1

**Low Speed Diesel 50MW
Stage 3**

**Table 1 (cont.)
Appendix D**

FUEL AND CONVERSION TECHNOLOGIES

EXTENSIVE PARAMETERS

key	tipo	C % *	H % *	O % *	N % *	S % *	Ash % *	H2O %	GHV BTU/lb	F _{dry} ft3/MMBTU	F _{wet} ft3/MMBTU	Gross output, MW	50.000
a	gas natural	72	23.8	1.32	2.8	0.0006	0	0	22000	8325	10271	Consumption, kg/hr	9157.8
b	distillate diesel	86.08	13.56	0	0.04	0.2	0	0	19000	8885	10168	Exhaust, m3/s actual	198.194
c	Bunker 1.8% S	86.5	11.2	0	0.3	1.8	0	0.2	18800	8633	9706	Gas velocity, m/s	30
d	Orimulsion 2.85% S	60	7.5	0	0	2.85	0.12	29	12984	8663	10139	Exhaust diameter, m	2.900
e	coal 1% S	78.8	5.2	6.9	1.6	1	6.8	12	12283	9125	9984	Cooling, MMBTU/hr	116.421
f	wood green	40.0	8.0	50.0	0	0.0008	2	50	3500	8961	13811	PM, g/s	3.113
A	combustion turbine single cycle	Reference temperature °C									0	SO2, g/s	126.734
B	combined cycle	Mol volume at reference temperature, m3									0.0224	CO, g/s	5.739
C	internal combustion engine, single cycle											CO2, g/s	8751.817
D	steam cycle	* dry base percentages for solid fuels										SO2, Mg/MW-day	0.219

GENERAL CHARACTERISTICS

key	select a case	Uncontrolled emission factors (lb/MMBTU)							Efficiency %	Consumption		Exhaust Gases				Cooling BTU/kwh
		PM **	PM10 **	Nox*** **	SO2 **	CO **	CO2	H2O		g/kwh	g/kwh	O2% dry	Deg. °C	Sm3/kwh	Am3/kwh	
aA	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	35	9751	201	15	565	8.1	26.6	0
aB	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	55	6205	128	15	120	5.2	8.0	2553
bA	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	35	9751	233	15	565	8.7	27.8	0
bB	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	55	6205	148	15	120	5.5	8.3	2482
bC	0	0.1	0.05	3.20	0.21	0.850	166	64	45	7584	181	13	342	5.0	12.0	2328
cC	1	0.21	0.151	5.78	2.65	0.120	183	54	45	7584	183	15	300	6.6	14.3	2328
dC	0	0.145	0.104	2.89	4.39	0.200	169	74	45	7584	265	13	300	4.9	9.7	2328
aD	0	1.8E-03	9.0E-04	0.27	5.5E-04	0.080	120	97	35	9751	201	3	120	2.7	4.6	3169
bD	0	0.01	0.01	0.17	0.21	0.036	166	64	35	9751	233	3	120	2.9	4.6	3169
cD	0	0.13	0.09	0.31	1.91	0.033	169	54	35	9751	235	3	120	2.8	4.4	3169
dD	0	0.20	0.14	0.24	4.39	0.033	169	74	35	9751	341	3	130	2.8	4.7	3169
eD	0	2.77	1.02	0.90	1.63	0.020	206	43	35	9751	360	3	150	2.9	4.9	3169
fD	0	0.40	0.36	0.49	0.00	0.600	210	246	30	11377	1476	6	150	4.0	8.7	3982

EMISSION CONTROL

** US EPA AP-42 or vendor warranties

key	Uncontrolled EmissionsI (g/kwh)							Minimum Control **** (%)					SPREADSHEET EMISSIONS FROM THERMAL POWER area to enter extensive data area to enter intensive data
	PM	PM10	Nox***	SO2	CO	CO2	H2O	PM	PM10	Nox***	SO2	CO	
	0.01	0.00	1.42	0.00	0.36	531	431	0%	0%	0%	0%	0%	0%
	0.01	0.00	0.90	0.00	0.23	338	274	0%	0%	0%	0%	0%	0%
	0.02	0.01	3.90	0.93	0.01	735	284	0%	0%	0%	0%	0%	0%
	0.01	0.01	2.48	0.59	0.01	468	181	0%	0%	0%	0%	0%	0%
	0.34	0.17	11.02	0.72	2.93	572	221	0%	0%	0%	0%	0%	0%
cC	0.72	0.52	19.90	9.12	0.41	630	185	69%	69%	34%	0%	0%	0%
	0.50	0.36	9.94	15.12	0.69	583	256	0%	0%	0%	0%	0%	0%
	0.01	0.00	1.18	0.00	0.35	531	431	0%	0%	0%	0%	0%	0%
	0.06	0.04	0.76	0.93	0.16	735	284	0%	0%	0%	0%	0%	0%
	0.58	0.41	1.39	8.48	0.15	747	237	0%	0%	10%	0%	0%	0%
	0.87	0.62	1.04	19.44	0.15	750	329	0%	0%	0%	0%	0%	0%
	12.25	4.53	3.96	7.21	0.09	914	191	0.0%	0.0%	84%	0%	0%	0%
	2.07	1.86	2.53	0.02	3.10	1082	1269	0%	0%	0%	0%	0%	0%

*** Nox as NO2

INTENSIVE PARAMETERS

**** to meet World Bank guidelines

key	Actual Emissions (g/kwh)						Stack Gas Concentraciones (dry reference conditions)								H2O %	
	PM g/kwh	PM10 g/kwh	Nox*** g/kwh	SO2 g/kwh	CO g/kwh	CO2 g/kwh	PM mg/m3	PM10 mg/m3	Nox*** mg/m3	SO2 mg/m3	CO mg/m3	CO2 mg/m3	Nox %	ppm		ppm
	0.01	0.00	1.42	0.00	0.36	531	1	1	174	0	45	3.3	89	0	36	6.2
	0.01	0.00	0.90	0.00	0.23	338	1	1	174	0	45	3.3	89	0	36	6.2
	0.02	0.01	3.90	0.93	0.01	735	2	1	448	107	2	4.3	228	38	1	3.9
	0.01	0.01	2.48	0.59	0.01	468	2	1	448	107	2	4.3	228	38	1	3.9
	0.34	0.17	11.02	0.72	2.93	572	68	34	2182	144	580	5.8	1111	50	464	5.2
cC	0.22	0.16	13.14	9.12	0.41	630	34	25	2000	1389	63	4.9	1018	486	50	3.4
	0.50	0.36	9.94	15.12	0.69	583	101	73	2020	3071	140	6.0	1028	1075	112	6.9
	0.01	0.00	1.18	0.00	0.35	531	3	1	440	1	132	10.1	224	0	106	16.6
	0.06	0.04	0.76	0.93	0.16	735	22	16	265	325	55	13.1	135	114	44	11.0
	0.58	0.41	1.25	8.48	0.15	747	210	149	449	3046	53	13.7	228	1066	42	9.6
	0.87	0.62	1.04	19.44	0.15	750	311	221	372	6958	53	13.7	190	2435	42	12.8
	12.254	4.534	0.634	7.208	0.090	914	4165	1541	216	2450	31	15.8	110	857	24	7.5
	2.07	1.86	2.53	0.02	3.10	1082	510	459	625	6	765	13.6	318	2	612	28.1

**Combined Cycle Plant
Stage 1
(natural gas)**

**Table 2
Appendix D**

FUEL AND CONVERSION TECHNOLOGIES

EXTENSIVE PARAMETERS

key	tipo	C % *	H % *	O % *	N % *	S % *	Ash % *	H2O %	GHV BTU lb	F _{dry} ft3	F _{wet} ft3	Gross output, MW	24.700
a	gas natural	72	23.8	1.32	2.8	0.0006	0	0	22000	8325	10271	Consumption, kg/hr	3163.0
b	distillate diesel	86.08	13.56	0	0.04	0.2	0	0	19000	8885	10168	Exhaust, m3/s actual	54.567
c	Bunker 1.8% S	86.5	11.2	0	0.3	1.8	0	0.2	18800	8633	9706	Gas velocity, m/s	30
d	Orimulsion 2.85% S	60	7.5	0	0	2.85	0.12	29	12984	8663	10139	Exhaust diameter, m	1.522
e	coal 1% S	78.8	5.2	6.9	1.6	1	6.8	12	12283	9125	9984	Cooling, MMBTU/hr	63.062
f	wood green	40.0	8.0	50.0	0	0.0008	2	50	3500	8961	13811	PM, g/s	0.037
A	combustion turbine single cycle	Reference temperature °C									0	SO2, g/s	0.011
B	combined cycle	Mol volume at reference temperature, m3									0.0224	CO, g/s	1.585
C	internal combustion engine, single cycle	* dry base percentages for solid fuels										CO2, g/s	2319.558
D	steam cycle											SO2, Mg/MW-day	0.000

GENERAL CHARACTERISTICS

key	select a case	Uncontrolled emission factors (lb/MMBTU)							H2O	Efficiency %	Consumption		Exhaust Gases			Cooling BTU kwh
		PM **	PM10 **	Nox*** **	SO2 **	CO **	CO2	g kwh			g kwh	O2 dry	Deg. °C	Sm3 kwh	Am3 kwh	
aA	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	35	9751	201	15	565	8.1	26.6	0
aB	1	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	55	6205	128	15	120	5.2	8.0	2553
bA	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	35	9751	233	15	565	8.7	27.8	0
bB	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	55	6205	148	15	120	5.5	8.3	2482
bC	0	0.1	0.05	3.20	0.21	0.850	166	64	45	7584	181	13	342	5.0	12.0	2328
cC	0	0.145	0.104	3.85	1.91	0.200	169	54	45	7584	183	13	300	4.9	10.8	2328
dC	0	0.145	0.104	2.89	4.39	0.200	169	74	45	7584	265	13	300	4.9	9.7	2328
aD	0	1.8E-03	9.0E-04	0.27	5.5E-04	0.080	120	97	35	9751	201	3	120	2.7	4.6	3169
bD	0	0.01	0.01	0.17	0.21	0.036	166	64	35	9751	233	3	120	2.9	4.6	3169
cD	0	0.13	0.09	0.31	1.91	0.033	169	54	35	9751	235	3	120	2.8	4.4	3169
dD	0	0.20	0.14	0.24	4.39	0.033	169	74	35	9751	341	3	130	2.8	4.7	3169
eD	0	2.77	1.02	0.90	1.63	0.020	206	43	35	9751	360	3	150	2.9	4.9	3169
fD	0	0.40	0.36	0.49	0.00	0.600	210	246	30	11377	1476	6	150	4.0	8.7	3982

EMISSION CONTROL

** US EPA AP-42 or vendor warranties

key	Uncontrolled EmissionsI (g/kwh)							Minimum Control **** (%)					SPREADSHEET EMISSIONS FROM THERMAL POWER area to enter extensive data area to enter intensive data
	PM	PM10	Nox***	SO2	CO	CO2	H2O	PM	PM10	Nox***	SO2	CO	
aB	0.01	0.00	1.42	0.00	0.36	531	431	0%	0%	0%	0%	0%	0%
	0.02	0.01	3.90	0.93	0.01	735	284	0%	0%	75%	0%	0%	0%
	0.01	0.01	2.48	0.59	0.01	468	181	0%	0%	0%	0%	0%	0%
	0.34	0.17	11.02	0.72	2.93	572	221	0%	0%	0%	0%	0%	0%
	0.50	0.36	13.26	6.59	0.69	581	185	0%	0%	0%	0%	0%	0%
	0.50	0.36	9.94	15.12	0.69	583	256	0%	0%	0%	0%	0%	0%
	0.01	0.00	1.18	0.00	0.35	531	431	0%	0%	0%	0%	0%	0%
	0.06	0.04	0.76	0.93	0.16	735	284	0%	0%	0%	0%	0%	0%
	0.58	0.41	1.39	8.48	0.15	747	237	0%	0%	0%	0%	0%	0%
	0.87	0.62	1.04	19.44	0.15	750	329	0%	0%	0%	0%	0%	0%
	12.25	4.53	3.96	7.21	0.09	914	191	0.0%	0.0%	0%	0%	0%	0%
	2.07	1.86	2.53	0.02	3.10	1082	1269	0%	0%	0%	0%	0%	0%

*** Nox as NO2

INTENSIVE PARAMETERS

**** to meet World Bank guidelines

key	Actual Emissions (g/kwh)						Stack Gas Concentraciones (dry reference conditions)									
	PM g/kwh	PM10 g/kwh	Nox*** g/kwh	SO2 g/kwh	CO g/kwh	CO2 g/kwh	PM mg/m3	PM10 mg/m3	Nox*** mg/m3	SO2 mg/m3	CO mg/m3	CO2 mg/m3	Nox %	SO2 ppm	CO ppm	H2O %
aB	0.01	0.00	1.42	0.00	0.36	531	1	1	174	0	45	3.3	89	0	36	6.2
	0.02	0.01	3.90	0.93	0.01	735	2	1	448	107	2	4.3	228	38	1	3.9
	0.01	0.01	2.48	0.59	0.01	468	2	1	448	107	2	4.3	228	38	1	3.9
	0.34	0.17	11.02	0.72	2.93	572	68	34	2182	144	580	5.8	1111	50	464	5.2
	0.50	0.36	13.26	6.59	0.69	581	102	73	2703	1344	140	6.0	1376	470	112	4.5
	0.50	0.36	9.94	15.12	0.69	583	101	73	2020	3071	140	6.0	1028	1075	112	6.9
	0.01	0.00	1.18	0.00	0.35	531	3	1	440	1	132	10.1	224	0	106	16.6
	0.06	0.04	0.76	0.93	0.16	735	22	16	265	325	55	13.1	135	114	44	11.0
	0.58	0.41	1.39	8.48	0.15	747	210	149	498	3046	53	13.7	254	1066	42	9.6
	0.87	0.62	1.04	19.44	0.15	750	311	221	372	6958	53	13.7	190	2435	42	12.8
	12.254	4.534	3.965	7.208	0.090	914	4165	1541	1347	2450	31	15.8	686	857	24	7.5
	2.07	1.86	2.53	0.02	3.10	1082	510	459	625	6	765	13.6	318	2	612	28.1

**Combined Cycle Plant
Stage 2
(natural gas)**

**Table 2 (cont.)
Appendix D**

FUEL AND CONVERSION TECHNOLOGIES

EXTENSIVE PARAMETERS

key	tipo	C %*	H %*	O %*	N %*	S %*	Ash %*	H2O %	GHV BTU/lb	F _{dry} ft ³ /MMBTU	F _{wet} ft ³ /MMBTU	Gross output, MW	30.400
a	gas natural	72	23.8	1.32	2.8	0.0006	0	0	22000	8325	10271	Consumption, kg/hr	3893.0
b	distillate diesel	86.08	13.56	0	0.04	0.2	0	0	19000	8885	10168	Exhaust, m3/s actual	67.160
c	Bunker 1.8% S	86.5	11.2	0	0.3	1.8	0	0.2	18800	8633	9706	Gas velocity, m/s	30
d	Orimulsion 2.85% S	60	7.5	0	0	2.85	0.12	29	12984	8663	10139	Exhaust diameter, m	1.688
e	coal 1% S	78.8	5.2	6.9	1.6	1	6.8	12	12283	9125	9984	Cooling, MMBTU/hr	77.614
f	wood green	40.0	8.0	50.0	0	0.0008	2	50	3500	8961	13811	PM, g/s	0.045
A	combustion turbine single cycle	Reference temperature °C									0	SO ₂ , g/s	0.013
B	combined cycle	Mol volume at reference temperature, m3									0.0224	CO, g/s	1.951
C	internal combustion engine, single cycle	* dry base percentages for solid fuels										CO ₂ , g/s	2854.840
D	steam cycle											SO ₂ , Mg/MW-day	0.000

GENERAL CHARACTERISTICS

key	select a case	Uncontrolled emission factors (lb/MMBTU)							H2O	Efficiency %	Consumption		Exhaust Gases			Cooling BTU/kwh
		PM **	PM10 **	Nox*** **	SO ₂	CO **	CO ₂	g/kwh			g/kwh	O ₂ dry	Deg. °C	Sm ₃ /kwh	Am ₃ /kwh	
aA	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	35	9751	201	15	565	8.1	26.6	0
aB	1	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	55	6205	128	15	120	5.2	8.0	2553
bA	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	35	9751	233	15	565	8.7	27.8	0
bB	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	55	6205	148	15	120	5.5	8.3	2482
bC	0	0.1	0.05	3.20	0.21	0.850	166	64	45	7584	181	13	342	5.0	12.0	2328
cC	0	0.145	0.104	3.85	1.91	0.200	169	54	45	7584	183	13	300	4.9	10.8	2328
dC	0	0.145	0.104	2.89	4.39	0.200	169	74	45	7584	265	13	300	4.9	9.7	2328
aD	0	1.8E-03	9.0E-04	0.27	5.5E-04	0.080	120	97	35	9751	201	3	120	2.7	4.6	3169
bD	0	0.01	0.01	0.17	0.21	0.036	166	64	35	9751	233	3	120	2.9	4.6	3169
cD	0	0.13	0.09	0.31	1.91	0.033	169	54	35	9751	235	3	120	2.8	4.4	3169
dD	0	0.20	0.14	0.24	4.39	0.033	169	74	35	9751	341	3	130	2.8	4.7	3169
eD	0	2.77	1.02	0.90	1.63	0.020	206	43	35	9751	360	3	150	2.9	4.9	3169
fD	0	0.40	0.36	0.49	0.00	0.600	210	246	30	11377	1476	6	150	4.0	8.7	3982

EMISSION CONTROL

** US EPA AP-42 or vendor warranties

key	Uncontrolled EmissionsI (g/kwh)							Minimum Control **** (%)					SPREADSHEET EMISSIONS FROM THERMAL POWER area to enter extensive data area to enter intensive data
	PM	PM10	Nox***	SO ₂	CO	CO ₂	H ₂ O	PM	PM10	Nox***	SO ₂	CO	
aB	0.01	0.00	1.42	0.00	0.36	531	431	0%	0%	0%	0%	0%	0%
	0.02	0.01	3.90	0.93	0.01	735	284	0%	0%	0%	0%	0%	0%
	0.01	0.01	2.48	0.59	0.01	468	181	0%	0%	0%	0%	0%	0%
	0.34	0.17	11.02	0.72	2.93	572	221	0%	0%	0%	0%	0%	0%
	0.50	0.36	13.26	6.59	0.69	581	185	0%	0%	0%	0%	0%	0%
	0.50	0.36	9.94	15.12	0.69	583	256	0%	0%	0%	0%	0%	0%
	0.01	0.00	1.18	0.00	0.35	531	431	0%	0%	0%	0%	0%	0%
	0.06	0.04	0.76	0.93	0.16	735	284	0%	0%	0%	0%	0%	0%
	0.58	0.41	1.39	8.48	0.15	747	237	0%	0%	0%	0%	0%	0%
	0.87	0.62	1.04	19.44	0.15	750	329	0%	0%	0%	0%	0%	0%
	12.25	4.53	3.96	7.21	0.09	914	191	0.0%	0.0%	0%	0%	0%	0%
	2.07	1.86	2.53	0.02	3.10	1082	1269	0%	0%	0%	0%	0%	0%

**** to meet World Bank guidelines

INTENSIVE PARAMETERS

key	Actual Emissions (g/kwh)						Stack Gas Concentraciones (dry reference conditions)									
	PM g/kwh	PM10 g/kwh	Nox*** g/kwh	SO ₂ g/kwh	CO g/kwh	CO ₂ g/kwh	PM mg/m3	PM10 mg/m3	Nox*** mg/m3	SO ₂ mg/m3	CO mg/m3	CO ₂ %	Nox ppm	SO ₂ ppm	CO ppm	H ₂ O %
aB	0.01	0.00	1.42	0.00	0.36	531	1	1	174	0	45	3.3	89	0	36	6.2
	0.02	0.01	3.90	0.93	0.01	735	2	1	448	107	2	4.3	228	38	1	3.9
	0.01	0.01	2.48	0.59	0.01	468	2	1	448	107	2	4.3	228	38	1	3.9
	0.34	0.17	11.02	0.72	2.93	572	68	34	2182	144	580	5.8	1111	50	464	5.2
	0.50	0.36	13.26	6.59	0.69	581	102	73	2703	1344	140	6.0	1376	470	112	4.5
	0.50	0.36	9.94	15.12	0.69	583	101	73	2020	3071	140	6.0	1028	1075	112	6.9
	0.01	0.00	1.18	0.00	0.35	531	3	1	440	1	132	10.1	224	0	106	16.6
	0.06	0.04	0.76	0.93	0.16	735	22	16	265	325	55	13.1	135	114	44	11.0
	0.58	0.41	1.39	8.48	0.15	747	210	149	498	3046	53	13.7	254	1066	42	9.6
	0.87	0.62	1.04	19.44	0.15	750	311	221	372	6958	53	13.7	190	2435	42	12.8
	12.254	4.534	3.965	7.208	0.090	914	4165	1541	1347	2450	31	15.8	686	857	24	7.5
	2.07	1.86	2.53	0.02	3.10	1082	510	459	625	6	765	13.6	318	2	612	28.1

**Combined Cycle Plant
Stage 3
(natural gas)**

**Table 2 (cont.)
Appendix D**

FUEL AND CONVERSION TECHNOLOGIES

EXTENSIVE PARAMETERS

key	tipo	C % *	H % *	O % *	N % *	S % *	Ash % *	H2O %	GHV BTU/lb	F _{dry} ft ³	F _{wet} ft ³	Gross output, MW	
a	gas natural	72	23.8	1.32	2.8	0.0006	0	0	22000	8325	10271	42.300	
b	distillate diesel	86.08	13.56	0	0.04	0.2	0	0	19000	8885	10168	5416.9	
c	Bunker 1.8% S	86.5	11.2	0	0.3	1.8	0	0.2	18800	8633	9706	93.449	
d	Orimulsion 2.85% S	60	7.5	0	0	2.85	0.12	29	12984	8663	10139	30	
e	coal 1% S	78.8	5.2	6.9	1.6	1	6.8	12	12283	9125	9984	1.992	
f	wood green	40.0	8.0	50.0	0	0.0008	2	50	3500	8961	13811	107.996	
A	combustion turbine single cycle	Reference temperature °C						0					0.018
B	combined cycle	Mol volume at reference temperature, m3						0.0224					2.714
C	internal combustion engine, single cycle												3972.360
D	steam cycle	* dry base percentages for solid fuels											0.000

GENERAL CHARACTERISTICS

key	select a case	Uncontrolled emission factors (lb/MMBTU)						H2O	Efficiency %	Consumption		Exhaust Gases				Cooling BTU/kwh
		PM **	PM10 **	Nox*** **	SO2 **	CO **	CO2 **			BTU/kwh	g/kwh	O2% dry	Deg. °C	Sm3/kwh	Am3/kwh	
aA	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	35	9751	201	15	565	8.1	26.6	0
aB	1	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	55	6205	128	15	120	5.2	8.0	2553
bA	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	35	9751	233	15	565	8.7	27.8	0
bB	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	55	6205	148	15	120	5.5	8.3	2482
bC	0	0.1	0.05	3.20	0.21	0.850	166	64	45	7584	181	13	342	5.0	12.0	2328
cC	0	0.145	0.104	3.85	1.91	0.200	169	54	45	7584	183	13	300	4.9	10.8	2328
dC	0	0.145	0.104	2.89	4.39	0.200	169	74	45	7584	265	13	300	4.9	9.7	2328
aD	0	1.8E-03	9.0E-04	0.27	5.5E-04	0.080	120	97	35	9751	201	3	120	2.7	4.6	3169
bD	0	0.01	0.01	0.17	0.21	0.036	166	64	35	9751	233	3	120	2.9	4.6	3169
cD	0	0.13	0.09	0.31	1.91	0.033	169	54	35	9751	235	3	120	2.8	4.4	3169
dD	0	0.20	0.14	0.24	4.39	0.033	169	74	35	9751	341	3	130	2.8	4.7	3169
eD	0	2.77	1.02	0.90	1.63	0.020	206	43	35	9751	360	3	150	2.9	4.9	3169
fD	0	0.40	0.36	0.49	0.00	0.600	210	246	30	11377	1476	6	150	4.0	8.7	3982

EMISSION CONTROL

** US EPA AP-42 or vendor warranties

key	Uncontrolled EmissionsI (g/kwh)							Minimum Control **** (%)						SPREADSHEET EMISSIONS FROM THERMAL POWER area to enter extensive data area to enter intensive data
	PM	PM10	Nox***	SO2	CO	CO2	H2O	PM	PM10	Nox***	SO2	CO	CO2	
aB	0.01	0.00	1.42	0.00	0.36	531	431	0%	0%	0%	0%	0%	0%	
	0.02	0.01	3.90	0.93	0.01	735	284	0%	0%	75%	0%	0%	0%	
	0.01	0.01	2.48	0.59	0.01	468	181	0%	0%	0%	0%	0%	0%	
	0.34	0.17	11.02	0.72	2.93	572	221	0%	0%	0%	0%	0%	0%	
	0.50	0.36	13.26	6.59	0.69	581	185	0%	0%	0%	0%	0%	0%	
	0.50	0.36	9.94	15.12	0.69	583	256	0%	0%	0%	0%	0%	0%	
	0.01	0.00	1.18	0.00	0.35	531	431	0%	0%	0%	0%	0%	0%	
	0.06	0.04	0.76	0.93	0.16	735	284	0%	0%	0%	0%	0%	0%	
	0.58	0.41	1.39	8.48	0.15	747	237	0%	0%	0%	0%	0%	0%	
	0.87	0.62	1.04	19.44	0.15	750	329	0%	0%	0%	0%	0%	0%	
	12.25	4.53	3.96	7.21	0.09	914	191	0.0%	0.0%	0%	0%	0%	0%	
	2.07	1.86	2.53	0.02	3.10	1082	1269	0%	0%	0%	0%	0%	0%	

INTENSIVE PARAMETERS

**** to meet World Bank guidelines

key	Actual Emissions (g/kwh)						Stack Gas Concentraciones (dry reference conditions)									
	PM g/kwh	PM10 g/kwh	Nox*** g/kwh	SO2 g/kwh	CO g/kwh	CO2 g/kwh	PM mg/m3	PM10 mg/m3	Nox*** mg/m3	SO2 mg/m3	CO mg/m3	CO2 %	Nox ppm	SO2 ppm	CO ppm	H2O %
aB	0.01	0.00	1.42	0.00	0.36	531	1	1	174	0	45	3.3	89	0	36	6.2
	0.02	0.01	3.90	0.93	0.01	735	2	1	448	107	2	4.3	228	38	1	3.9
	0.01	0.01	2.48	0.59	0.01	468	2	1	448	107	2	4.3	228	38	1	3.9
	0.34	0.17	11.02	0.72	2.93	572	68	34	2182	144	580	5.8	1111	50	464	5.2
	0.50	0.36	13.26	6.59	0.69	581	102	73	2703	1344	140	6.0	1376	470	112	4.5
	0.50	0.36	9.94	15.12	0.69	583	101	73	2020	3071	140	6.0	1028	1075	112	6.9
	0.01	0.00	1.18	0.00	0.35	531	3	1	440	1	132	10.1	224	0	106	16.6
	0.06	0.04	0.76	0.93	0.16	735	22	16	265	325	55	13.1	135	114	44	11.0
	0.58	0.41	1.39	8.48	0.15	747	210	149	498	3046	53	13.7	254	1066	42	9.6
	0.87	0.62	1.04	19.44	0.15	750	311	221	372	6958	53	13.7	190	2435	42	12.8
	12.254	4.534	3.965	7.208	0.090	914	4165	1541	1347	2450	31	15.8	686	857	24	7.5
	2.07	1.86	2.53	0.02	3.10	1082	510	459	625	6	765	13.6	318	2	612	28.1

**Combined Cycle Plant
Stage 1
(distillate fuel)**

**Table 3
Appendix D**

FUEL AND CONVERSION TECHNOLOGIES

EXTENSIVE PARAMETERS

key	tipo	C % *	H % *	O % *	N % *	S % *	Ash % *	H2O %	GHV BTU/lb	F _{dry} ft3/MMBTU	F _{wet} ft3/MMBTU	Gross output, MW	24.700
a	gas natural	72	23.8	1.32	2.8	0.0006	0	0	22000	8325	10271	Consumption, kg/hr	3662.5
b	distillate diesel	86.08	13.56	0	0.04	0.2	0	0	19000	8885	10168	Exhaust, m3/s actual	56.859
c	Bunker 1.8% S	86.5	11.2	0	0.3	1.8	0	0.2	18800	8633	9706	Gas velocity, m/s	1.553
d	Orimulsion 2.85% S	60	7.5	0	0	2.85	0.12	29	12984	8663	10139	Cooling, MMBTU/hr	61.310
e	coal 1% S	78.8	5.2	6.9	1.6	1	6.8	12	12283	9125	9984	PM, g/s	0.083
f	wood green	40.0	8.0	50.0	0	0.0008	2	50	3500	8961	13811	PM-10, g/s	0.042
A	combustion turbine single cycle	Reference temperature °C									0	SO2, g/s	4.069
B	combined cycle	Mol volume at reference temperature, m3									0.0224	CO, g/s	0.064
C	internal combustion engine, single cycle											CO2, g/s	3211.027
D	steam cycle	* dry base percentages for solid fuels										SO2, Mg/MW-day	0.014

GENERAL CHARACTERISTICS

key	select a case	Uncontrolled emission factors (lb/MMBTU)							Efficiency %	Consumption		Exhaust Gases			Cooling BTU/kwh	
		PM **	PM10 **	Nox*** **	SO2 **	CO **	CO2	H2O		g/kwh	g/kwh	O2% dry	Deg. °C	Sm3/kwh		Am3/kwh
aA	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	35	9751	201	15	565	8.1	26.6	0
aB	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	55	6205	128	15	120	5.2	8.0	2553
bA	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	35	9751	233	15	565	8.7	27.8	0
bB	1	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	55	6205	148	15	120	5.5	8.3	2482
bC	0	0.1	0.05	3.20	0.21	0.850	166	64	45	7584	181	13	342	5.0	12.0	2328
cC	0	0.145	0.104	3.85	1.91	0.200	169	54	45	7584	183	13	300	4.9	10.8	2328
dC	0	0.145	0.104	2.89	4.39	0.200	169	74	45	7584	265	13	300	4.9	9.7	2328
aD	0	1.8E-03	9.0E-04	0.27	5.5E-04	0.080	120	97	35	9751	201	3	120	2.7	4.6	3169
bD	0	0.01	0.01	0.17	0.21	0.036	166	64	35	9751	233	3	120	2.9	4.6	3169
cD	0	0.13	0.09	0.31	1.91	0.033	169	54	35	9751	235	3	120	2.8	4.4	3169
dD	0	0.20	0.14	0.24	4.39	0.033	169	74	35	9751	341	3	130	2.8	4.7	3169
eD	0	2.77	1.02	0.90	1.63	0.020	206	43	35	9751	360	3	150	2.9	4.9	3169
fD	0	0.40	0.36	0.49	0.00	0.600	210	246	30	11377	1476	6	150	4.0	8.7	3982

EMISSION CONTROL

** US EPA AP-42 or vendor warranties

key	Uncontrolled EmissionsI (g/kwh)							Minimum Control **** (%)					SPREADSHEET EMISSIONS FROM THERMAL POWER area to enter extensive data area to enter intensive data
	PM	PM10	Nox***	SO2	CO	CO2	H2O	PM	PM10	Nox***	SO2	CO	
	0.01	0.00	1.42	0.00	0.36	531	431	0%	0%	0%	0%	0%	0%
	0.01	0.00	0.90	0.00	0.23	338	274	0%	0%	0%	0%	0%	0%
	0.02	0.01	3.90	0.93	0.01	735	284	0%	0%	0%	0%	0%	0%
bB	0.01	0.01	2.48	0.59	0.01	468	181	0%	0%	75%	0%	0%	0%
	0.34	0.17	11.02	0.72	2.93	572	221	0%	0%	0%	0%	0%	0%
	0.50	0.36	13.26	6.59	0.69	581	185	0%	0%	0%	0%	0%	0%
	0.50	0.36	9.94	15.12	0.69	583	256	0%	0%	0%	0%	0%	0%
	0.01	0.00	1.18	0.00	0.35	531	431	0%	0%	0%	0%	0%	0%
	0.06	0.04	0.76	0.93	0.16	735	284	0%	0%	0%	0%	0%	0%
	0.58	0.41	1.39	8.48	0.15	747	237	0%	0%	0%	0%	0%	0%
	0.87	0.62	1.04	19.44	0.15	750	329	0%	0%	0%	0%	0%	0%
	12.25	4.53	3.96	7.21	0.09	914	191	0.0%	0.0%	0%	0%	0%	0%
	2.07	1.86	2.53	0.02	3.10	1082	1269	0%	0%	0%	0%	0%	0%

*** Nox as NO2

INTENSIVE PARAMETERS

**** to meet World Bank guidelines

key	Actual Emissions (g/kwh)						Stack Gas Concentraciones (dry reference conditions)									
	PM g/kwh	PM10 g/kwh	Nox*** g/kwh	SO2 g/kwh	CO g/kwh	CO2 g/kwh	PM mg/m3	PM10 mg/m3	Nox*** mg/m3	SO2 mg/m3	CO mg/m3	CO2 %	Nox ppm	SO2 ppm	CO ppm	H2O %
	0.01	0.00	1.42	0.00	0.36	531	1	1	174	0	45	3.3	89	0	36	6.2
	0.01	0.00	0.90	0.00	0.23	338	1	1	174	0	45	3.3	89	0	36	6.2
	0.02	0.01	3.90	0.93	0.01	735	2	1	448	107	2	4.3	228	38	1	3.9
bB	0.01	0.01	0.62	0.59	0.01	468	2	1	112	107	2	4.3	57	38	1	3.9
	0.34	0.17	11.02	0.72	2.93	572	68	34	2182	144	580	5.8	1111	50	464	5.2
	0.50	0.36	13.26	6.59	0.69	581	102	73	2703	1344	140	6.0	1376	470	112	4.5
	0.50	0.36	9.94	15.12	0.69	583	101	73	2020	3071	140	6.0	1028	1075	112	6.9
	0.01	0.00	1.18	0.00	0.35	531	3	1	440	1	132	10.1	224	0	106	16.6
	0.06	0.04	0.76	0.93	0.16	735	22	16	265	325	55	13.1	135	114	44	11.0
	0.58	0.41	1.39	8.48	0.15	747	210	149	498	3046	53	13.7	254	1066	42	9.6
	0.87	0.62	1.04	19.44	0.15	750	311	221	372	6958	53	13.7	190	2435	42	12.8
	12.254	4.534	3.965	7.208	0.090	914	4165	1541	1347	2450	31	15.8	686	857	24	7.5
	2.07	1.86	2.53	0.02	3.10	1082	510	459	625	6	765	13.6	318	2	612	28.1

**Combined Cycle Plant
Stage 2
(distillate fuel)**

**Table 3 (cont.)
Appendix D**

FUEL AND CONVERSION TECHNOLOGIES

EXTENSIVE PARAMETERS

key	tipo	C % *	H % *	O % *	N % *	S % *	Ash % *	H2O %	GHV BTU/lb	F _{dry} ft ³ /MMBTU	F _{wet} ft ³ /MMBTU	Gross output, MW	30.400
a	gas natural	72	23.8	1.32	2.8	0.0006	0	0	22000	8325	10271	Consumption, kg/hr	4507.6
b	distillate diesel	86.08	13.56	0	0.04	0.2	0	0	19000	8885	10168	Exhaust, m3/s actual	69.980
c	Bunker 1.8% S	86.5	11.2	0	0.3	1.8	0	0.2	18800	8633	9706	Gas velocity, m/s	30
d	Orimulsion 2.85% S	60	7.5	0	0	2.85	0.12	29	12984	8663	10139	Exhaust diameter, m	1.723
e	coal 1% S	78.8	5.2	6.9	1.6	1	6.8	12	12283	9125	9984	Cooling, MMBTU/hr	75.458
f	wood green	40.0	8.0	50.0	0	0.0008	2	50	3500	8961	13811	PM, g/s	0.102
A	combustion turbine single cycle	Reference temperature °C									0	SO ₂ , g/s	5.008
B	combined cycle	Mol volume at reference temperature, m3									0.0224	CO, g/s	0.079
C	internal combustion engine, single cycle											CO ₂ , g/s	3952.034
D	steam cycle	* dry base percentages for solid fuels										SO ₂ , Mg/MW-day	0.014

GENERAL CHARACTERISTICS

key	select a case	Uncontrolled emission factors (lb/MMBTU)							Efficiency %	Consumption		Exhaust Gases			Cooling BTU/kwh	
		PM **	PM10 **	Nox*** **	SO ₂	CO **	CO ₂	H ₂ O		g/kwh	g/kwh	O ₂ dry	Deg. °C	Sm ₃ /kwh		Am ₃ /kwh
aA	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	35	9751	201	15	565	8.1	26.6	0
aB	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	55	6205	128	15	120	5.2	8.0	2553
bA	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	35	9751	233	15	565	8.7	27.8	0
bB	1	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	55	6205	148	15	120	5.5	8.3	2482
bC	0	0.1	0.05	3.20	0.21	0.850	166	64	45	7584	181	13	342	5.0	12.0	2328
cC	0	0.145	0.104	3.85	1.91	0.200	169	54	45	7584	183	13	300	4.9	10.8	2328
dC	0	0.145	0.104	2.89	4.39	0.200	169	74	45	7584	265	13	300	4.9	9.7	2328
aD	0	1.8E-03	9.0E-04	0.27	5.5E-04	0.080	120	97	35	9751	201	3	120	2.7	4.6	3169
bD	0	0.01	0.01	0.17	0.21	0.036	166	64	35	9751	233	3	120	2.9	4.6	3169
cD	0	0.13	0.09	0.31	1.91	0.033	169	54	35	9751	235	3	120	2.8	4.4	3169
dD	0	0.20	0.14	0.24	4.39	0.033	169	74	35	9751	341	3	130	2.8	4.7	3169
eD	0	2.77	1.02	0.90	1.63	0.020	206	43	35	9751	360	3	150	2.9	4.9	3169
fD	0	0.40	0.36	0.49	0.00	0.600	210	246	30	11377	1476	6	150	4.0	8.7	3982

EMISSION CONTROL

** US EPA AP-42 or vendor warranties

key	Uncontrolled EmissionsI (g/kwh)							Minimum Control **** (%)					SPREADSHEET EMISSIONS FROM THERMAL POWER area to enter extensive data area to enter intensive data
	PM	PM10	Nox***	SO ₂	CO	CO ₂	H ₂ O	PM	PM10	Nox***	SO ₂	CO	
	0.01	0.00	1.42	0.00	0.36	531	431	0%	0%	0%	0%	0%	0%
	0.01	0.00	0.90	0.00	0.23	338	274	0%	0%	0%	0%	0%	0%
	0.02	0.01	3.90	0.93	0.01	735	284	0%	0%	0%	0%	0%	0%
bB	0.01	0.01	2.48	0.59	0.01	468	181	0%	0%	75%	0%	0%	0%
	0.34	0.17	11.02	0.72	2.93	572	221	0%	0%	0%	0%	0%	0%
	0.50	0.36	13.26	6.59	0.69	581	185	0%	0%	0%	0%	0%	0%
	0.50	0.36	9.94	15.12	0.69	583	256	0%	0%	0%	0%	0%	0%
	0.01	0.00	1.18	0.00	0.35	531	431	0%	0%	0%	0%	0%	0%
	0.06	0.04	0.76	0.93	0.16	735	284	0%	0%	0%	0%	0%	0%
	0.58	0.41	1.39	8.48	0.15	747	237	0%	0%	0%	0%	0%	0%
	0.87	0.62	1.04	19.44	0.15	750	329	0%	0%	0%	0%	0%	0%
	12.25	4.53	3.96	7.21	0.09	914	191	0.0%	0.0%	0%	0%	0%	0%
	2.07	1.86	2.53	0.02	3.10	1082	1269	0%	0%	0%	0%	0%	0%

*** Nox as NO₂

INTENSIVE PARAMETERS

**** to meet World Bank guidelines

key	Actual Emissions (g/kwh)						Stack Gas Concentraciones (dry reference conditions)									
	PM g/kwh	PM10 g/kwh	Nox*** g/kwh	SO ₂ g/kwh	CO g/kwh	CO ₂ g/kwh	PM mg/m3	PM10 mg/m3	Nox*** mg/m3	SO ₂ mg/m3	CO mg/m3	CO ₂ %	Nox ppm	SO ₂ ppm	CO ppm	H ₂ O %
	0.01	0.00	1.42	0.00	0.36	531	1	1	174	0	45	3.3	89	0	36	6.2
	0.01	0.00	0.90	0.00	0.23	338	1	1	174	0	45	3.3	89	0	36	6.2
	0.02	0.01	3.90	0.93	0.01	735	2	1	448	107	2	4.3	228	38	1	3.9
bB	0.01	0.01	0.62	0.59	0.01	468	2	1	112	107	2	4.3	57	38	1	3.9
	0.34	0.17	11.02	0.72	2.93	572	68	34	2182	144	580	5.8	1111	50	464	5.2
	0.50	0.36	13.26	6.59	0.69	581	102	73	2703	1344	140	6.0	1376	470	112	4.5
	0.50	0.36	9.94	15.12	0.69	583	101	73	2020	3071	140	6.0	1028	1075	112	6.9
	0.01	0.00	1.18	0.00	0.35	531	3	1	440	1	132	10.1	224	0	106	16.6
	0.06	0.04	0.76	0.93	0.16	735	22	16	265	325	55	13.1	135	114	44	11.0
	0.58	0.41	1.39	8.48	0.15	747	210	149	498	3046	53	13.7	254	1066	42	9.6
	0.87	0.62	1.04	19.44	0.15	750	311	221	372	6958	53	13.7	190	2435	42	12.8
	12.254	4.534	3.965	7.208	0.090	914	4165	1541	1347	2450	31	15.8	686	857	24	7.5
	2.07	1.86	2.53	0.02	3.10	1082	510	459	625	6	765	13.6	318	2	612	28.1

**Combined Cycle Plant
Stage 3
(distillate fuel)**

**Table 3 (cont.)
Appendix D**

FUEL AND CONVERSION TECHNOLOGIES

EXTENSIVE PARAMETERS

key	tipo	C % *	H % *	O % *	N % *	S % *	Ash % *	H2O %	GHV BTU/lb	F _{dry} ft ³ /MMBTU	F _{wet} ft ³ /MMBTU	Gross output, MW	
a	gas natural	72	23.8	1.32	2.8	0.0006	0	0	22000	8325	10271	42.300	
b	distillate diesel	86.08	13.56	0	0.04	0.2	0	0	19000	8885	10168	6272.1	
c	Bunker 1.8% S	86.5	11.2	0	0.3	1.8	0	0.2	18800	8633	9706	97.373	
d	Orimulsion 2.85% S	60	7.5	0	0	2.85	0.12	29	12984	8663	10139	2.033	
e	coal 1% S	78.8	5.2	6.9	1.6	1	6.8	12	12283	9125	9984	104.996	
f	wood green	40.0	8.0	50.0	0	0.0008	2	50	3500	8961	13811	0.142	
A	combustion turbine single cycle	Reference temperature °C						0					Nox ***, g/s
B	combined cycle	Mol volume at reference temperature, m3						0.0224					SO2, g/s
C	internal combustion engine, single cycle												CO, g/s
D	steam cycle	* dry base percentages for solid fuels											CO2, g/s
												SO2, Mg/MW-day	

GENERAL CHARACTERISTICS

key	select a case	Uncontrolled emission factors (lb/MMBTU)						H2O	Efficiency %	Consumption		Exhaust Gases				Cooling BTU/kwh
		PM **	PM10 **	Nox*** **	SO2 **	CO **	CO2 **			BTU/kwh	g/kwh	O2% dry	Deg. °C	Sm3/kwh	Am3/kwh	
aA	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	35	9751	201	15	565	8.1	26.6	0
aB	0	1.9E-03	9.5E-04	0.32	5.5E-04	0.082	120	97	55	6205	128	15	120	5.2	8.0	2553
bA	0	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	35	9751	233	15	565	8.7	27.8	0
bB	1	4.3E-03	2.2E-03	0.88	0.21	0.003	166	64	55	6205	148	15	120	5.5	8.3	2482
bC	0	0.1	0.05	3.20	0.21	0.850	166	64	45	7584	181	13	342	5.0	12.0	2328
cC	0	0.145	0.104	3.85	1.91	0.200	169	54	45	7584	183	13	300	4.9	10.8	2328
dC	0	0.145	0.104	2.89	4.39	0.200	169	74	45	7584	265	13	300	4.9	9.7	2328
aD	0	1.8E-03	9.0E-04	0.27	5.5E-04	0.080	120	97	35	9751	201	3	120	2.7	4.6	3169
bD	0	0.01	0.01	0.17	0.21	0.036	166	64	35	9751	233	3	120	2.9	4.6	3169
cD	0	0.13	0.09	0.31	1.91	0.033	169	54	35	9751	235	3	120	2.8	4.4	3169
dD	0	0.20	0.14	0.24	4.39	0.033	169	74	35	9751	341	3	130	2.8	4.7	3169
eD	0	2.77	1.02	0.90	1.63	0.020	206	43	35	9751	360	3	150	2.9	4.9	3169
fD	0	0.40	0.36	0.49	0.00	0.600	210	246	30	11377	1476	6	150	4.0	8.7	3982

EMISSION CONTROL

** US EPA AP-42 or vendor warranties

key	Uncontrolled EmissionsI (g/kwh)							Minimum Control **** (%)						SPREADSHEET EMISSIONS FROM THERMAL POWER area to enter extensive data area to enter intensive data
	PM	PM10	Nox***	SO2	CO	CO2	H2O	PM	PM10	Nox***	SO2	CO	CO2	
	0.01	0.00	1.42	0.00	0.36	531	431	0%	0%	0%	0%	0%	0%	
	0.01	0.00	0.90	0.00	0.23	338	274	0%	0%	0%	0%	0%	0%	
	0.02	0.01	3.90	0.93	0.01	735	284	0%	0%	0%	0%	0%	0%	
bB	0.01	0.01	2.48	0.59	0.01	468	181	0%	0%	75%	0%	0%	0%	
	0.34	0.17	11.02	0.72	2.93	572	221	0%	0%	0%	0%	0%	0%	
	0.50	0.36	13.26	6.59	0.69	581	185	0%	0%	0%	0%	0%	0%	
	0.50	0.36	9.94	15.12	0.69	583	256	0%	0%	0%	0%	0%	0%	
	0.01	0.00	1.18	0.00	0.35	531	431	0%	0%	0%	0%	0%	0%	
	0.06	0.04	0.76	0.93	0.16	735	284	0%	0%	0%	0%	0%	0%	
	0.58	0.41	1.39	8.48	0.15	747	237	0%	0%	0%	0%	0%	0%	
	0.87	0.62	1.04	19.44	0.15	750	329	0%	0%	0%	0%	0%	0%	
	12.25	4.53	3.96	7.21	0.09	914	191	0.0%	0.0%	0%	0%	0%	0%	
	2.07	1.86	2.53	0.02	3.10	1082	1269	0%	0%	0%	0%	0%	0%	

INTENSIVE PARAMETERS

**** to meet World Bank guidelines

key	Actual Emissions (g/kwh)						Stack Gas Concentraciones (dry reference conditions)									
	PM	PM10	Nox***	SO2	CO	CO2	PM	PM10	Nox***	SO2	CO	CO2	Nox	SO2	CO	H2O
	g/kwh	g/kwh	g/kwh	g/kwh	g/kwh	g/kwh	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	%	ppm	ppm	ppm	%
	0.01	0.00	1.42	0.00	0.36	531	1	1	174	0	45	3.3	89	0	36	6.2
	0.01	0.00	0.90	0.00	0.23	338	1	1	174	0	45	3.3	89	0	36	6.2
	0.02	0.01	3.90	0.93	0.01	735	2	1	448	107	2	4.3	228	38	1	3.9
bB	0.01	0.01	0.62	0.59	0.01	468	2	1	112	107	2	4.3	57	38	1	3.9
	0.34	0.17	11.02	0.72	2.93	572	68	34	2182	144	580	5.8	1111	50	464	5.2
	0.50	0.36	13.26	6.59	0.69	581	102	73	2703	1344	140	6.0	1376	470	112	4.5
	0.50	0.36	9.94	15.12	0.69	583	101	73	2020	3071	140	6.0	1028	1075	112	6.9
	0.01	0.00	1.18	0.00	0.35	531	3	1	440	1	132	10.1	224	0	106	16.6
	0.06	0.04	0.76	0.93	0.16	735	22	16	265	325	55	13.1	135	114	44	11.0
	0.58	0.41	1.39	8.48	0.15	747	210	149	498	3046	53	13.7	254	1066	42	9.6
	0.87	0.62	1.04	19.44	0.15	750	311	221	372	6958	53	13.7	190	2435	42	12.8
	12.254	4.534	3.965	7.208	0.090	914	4165	1541	1347	2450	31	15.8	686	857	24	7.5
	2.07	1.86	2.53	0.02	3.10	1082	510	459	625	6	765	13.6	318	2	612	28.1

Stack Parameters

CCC - two stacks per stage			
	Stage 1	Stage 2	Stage 3
Stack diameter (m)	1.52	1.69	2.00
Height (m)	40.0	40.0	40.0
Exit velocity (m/s)	30.0	30.0	30.0
Temperature (K)	350	350	350