4 CSR 240-22.040 Appendix B Renewable Resource Characterization Table

	Capacity / Performance		Cost Estimates (2007)									Fuel Assumptions		
Characterization Parameters	**Net Plant Output, MW**	**Full Load Net Plant Heat Rate HHV, Btu/kWh**	**EPC Capital Cost, $1,000**	**Capital Cost, $/kW**	**Total Project Cost - Included Assumed Owners Cost, $1,000**	**Total Project Cost - Included Assumed Owners Cost, $/kW**	**First Year Fixed O&M Cost, $1,000**	**First Year Fixed O&M Cost, $/kW-yr**	**First Year Variable O&M Cost, $1,000**	**First Year Variable O&M Cost, $/MWh**	**Permitting Costs, $1.000**	**Assumed Fuel Type / Source**	**First Year Fuel Cost, $/MBtu**	**Fuel Flexibility**
Screened RenewableTechnologies														
Baseload														
Biomass Combustion - Standalone	35	13,300	105,300	3,010	137,000	3,910	3,730	106.7	1,890	7.4	1,000 – 1,400	Wood	1.50	Yes
Biomass Combustion - CHP	35	14,300	110,800	3,160	144,000	4,110	3,800	108.6	1,940	7.8	1,000 – 1,400	Wood	1.50	Yes
Biomass Combustion - Cofiring - Incremental - note 1	35	9,400	14,000	400	18,000	510	330	9.6	260	1.0	750 – 1,200	Wood	1.50	Yes
Landfill Gas - Reciprocating Engine	3	13,500	4,400	1,470	6,000	2,000	300	100.5	240	11.2	250 – 500	LFG	2.00	No
Landfill Gas - Combustion Turbine	5	12,500	7,400	1,480	10,000	2,000	200	40.3	370	9.9	250 – 500	LFG	2.00	No
Biomass IGCC	35	10,700	145,700	3,990	204,000	5,830	5,160	141.2	1,940	7.6	1,000 – 1,250	Wood	1.50	Yes
Waste-to-Energy - Mass Burn	35	16,000	148,500	4,240	208,000	5,940	5,720	163.3	13,530	55.2	1,000 – 1,400	MSW	-3.07	No
Waste-to-Energy RDF	35	17,000	178,200	5,090	249,000	7,110	7,800	222.7	11,730	47.8	1,000 – 1,400	RDF	-3.07	No
Waste-to-Energy Plasma Arc	35	14,700	142,900	4,080	200,000	5,710	6,970	199.0	12,800	52.2	1,000 – 1,400	MSW	-3.07	No
Intermediate / Peaking														
Hydroelectric - Run of River	25	n/a	n/a	n/a	48,500	1,940	343	13.7	377	4.3	750 – 1,200	Water	0.00	n/a
Hydroelectric - Dam	25	n/a	n/a	n/a	84,375	3,375	318	12.7	359	4.1	2,500 – 3,000	water	0.00	n/a
As Available														
Solar Photovoltaic - Commercial	0.5	n/a	4,000	8,000	4,200	8,400	10	20.0	13	23.0	100 – 200	Solar	0.00	n/a
Parabolic Trough w/o Storage	100	n/a	385,000	3,850	443,000	4,430	5,430	54.3	0	0	700 – 1,000	Solar	0.00	n/a
Parabolic Trough w/ 3 hr Storage	200	n/a	913,900	4,570	1,051,000	5,260	9,600	48.0	0	0	700 – 1,000	Solar	0.00	n/a
Parabolic Dish	100	n/a	297,000	2,970	342,000	3,420	5,600	56.0	0	0	500 – 800	Solar	0.00	n/a
Wind Farm (Tranche 1)	100	n/a	190,000	1,900	208,000	2,080	3,500	35.0	0	0	2,500 – 3,000	Wind	0.00	n/a
Wind Farm (Tranche 2)	100	n/a	210,000	2,100	232,000	2,320	3,500	35.0	0	0	2,500 – 3,000	Wind	0.00	n/a
Wind Farm (Tranche 3)	100	n/a	210,000	2,100	272,000	2,720	3,500	35.0	0	0	2,500 – 3,000	Wind	0.00	n/a
Energy Storage														
Battery Storage	10	n/a	900 to 1,700	90 to 170	990 to 1,870	99 to 187	50 to 150	5 to 15	44 to 175	10 to 40	NA	none	0.00	n/a
CAES	202	4,420	222,200	1,100	311,000	1,540	2,220	11.0	265	1.5	NA	Natural Gas	7.50	Limited

Notes:
1. Based on installation of new coal fired capacity. Costs are show as incremental.
2. SO2 emissions are highly variable. Sulfur in bio-gas can range from 100 ppmvd to 12,000 ppmvd.

	Characteristics						Environmental Characteristics					Economic Parameter										Levelized Cost of Energy	
Characterization Parameters	**Technology Maturity**	**Permitting & Development, months**	**NTP to COD, months**	**Assumed Annual Capacity Factor, percentage**	**EFOR, percentage**	**EFORd, percentage**	**NOx, lbm/MBtu**	**SO2, lbm/MBtu**	**CO2, lbm/MBtu**	**PM10, lbm/MBtu**	**Water Consumption, gal/min**	**Debt Term, years**	**Economic Life, years**	**Owner's Cost, percent**	**AFUDC Cost, percent**	**Total Owner's Cost, percent**	**FOM Escalation Rate, percent**	**VOM Escalation Rate, percent**	**Fuel Escalation Rate, percent**	**Present Worth Discount Rate, percent**	**Fixed Charge Rate, percent**	**Levelized Cost of Energy, $/MWh**	**Levelized Cost of Energy, ¢/kWh**
Screened RenewableTechnologies																							
Baseload																							
Biomass Combustion - Standalone	Mature	18 to 24	24	83%	10%	10%	0.15	<0.1	carbon neutral	0.015	300 to 400	20	20	21%	9%	30%	2.5%	2.5%	2.5%	8.90%	13.46%	123	12.3
Biomass Combustion - CHP	Mature	18 to 24	24	81%	10%	10%	0.15	<0.1	carbon neutral	0.015	300 to 400	20	20	21%	9%	30%	2.5%	2.5%	2.5%	8.90%	13.46%	131	13.1
Biomass Combustion - Cofiring - Incremental - note 1	Mature	12 to 18	12	85%	8%	8%	0.15	<0.1	carbon neutral	0.015	200 to 400	20	20	26%	4%	30%	2.5%	2.5%	2.5%	8.90%	13.46%	29	2.9
Landfill Gas - Reciprocating Engine	Mature	12 to 18	15	95%	8%	7%	0.2	Note 2	carbon neutral	0.03	0	15	15	24%	6%	30%	2.5%	2.5%	2.5%	8.90%	17.38%	100	10.0
Landfill Gas - Combustion Turbine	Mature	12 to 18	15	95%	7%	6%	0.2	Note 2	carbon neutral	0.01	0	15	15	24%	6%	30%	2.5%	2.5%	2.5%	8.90%	17.38%	87	8.7
Biomass IGCC	Developing	18 to 24	30	80%	14%	14%	0.15	<0.1	carbon neutral	0.015	250 to 350	20	20	29%	11%	40%	2.5%	2.5%	2.5%	8.90%	13.46%	164	16.4
Waste-to-Energy - Mass Burn	Mature	21 to 27	30	80%	10%	10%	0.34	0.05	200	0.015	300 to 400	20	20	29%	11%	40%	2.5%	2.5%	2.5%	8.90%	15.62%	167	16.7
Waste-to-Energy RDF	Mature	21 to 27	30	80%	10%	10%	0.32	0.05	200	0.015	300 to 400	20	20	29%	11%	40%	2.5%	2.5%	2.5%	8.90%	15.62%	191	19.1
Waste-to-Energy Plasma Arc	Developing	21 to 27	30	80%	12%	12%	0.2	0.05	200	0.015	n/a	20	20	29%	11%	40%	2.5%	2.5%	2.5%	8.90%	15.62%	170	17.0
Intermediate / Peaking																							
Hydroelectric - Run of River	Mature	21 to 27	24	40%	3%	3%	0	0	0	0	0	30	30	6%	9%	15%	2.5%	2.5%	2.5%	8.90%	14.08%	88	8.8
Hydroelectric - Dam	Mature	21 to 27	24	40%	3%	3%	0	0	0	0	0	30	30	6%	9%	15%	2.5%	2.5%	2.5%	8.90%	14.08%	145	14.5
As Available																							
Solar Photovoltaic - Commercial	Mature	9 to 15	12	21%	NA	NA	0	0	0	0	0	20	20	1%	4%	5%	2.5%	2.5%	2.5%	8.90%	13.46%	655	65.5
Parabolic Trough w/o Storage	Mature	9 to 15	20	14%	2%	NA	0	0	0	0	1,500	20	20	8%	7%	15%	2.5%	2.5%	2.5%	8.90%	13.46%	554	55.4
Parabolic Trough w/ 3 hr Storage	Developing	9 to 15	20	17%	2%	NA	0	0	0	0	1,500	20	20	8%	7%	15%	2.5%	2.5%	2.5%	8.90%	13.46%	515	51.5
Parabolic Dish	Developing	9 to 15	14	12%	NA	NA	0	0	0	0	0	20	20	10%	5%	15%	2.5%	2.5%	2.5%	8.90%	13.46%	523	52.3
Wind Farm (Tranche 1)	Mature	18 to 36	12	33%	5%	NA	0	0	0	0	0	20	20	1%	4%	5%	2.5%	2.5%	2.5%	8.90%	13.46%	111	11.1
Wind Farm (Tranche 2)	Mature	18 to 36	12	30%	5%	NA	0	0	0	0	0	20	20	4%	4%	9%	2.5%	2.5%	2.5%	8.90%	13.46%	115	11.5
Wind Farm (Tranche 3)	Mature	18 to 36	12	35%	5%	NA	0	0	0	0	0	20	20	38%	4%	42%	2.5%	2.5%	2.5%	8.90%	13.46%	119	11.9
Energy Storage																							
Battery Storage	Mature	9 to 15	6	5%	NA	NA	0	0	0	0	0	10	10	8%	2%	10%	2.5%	2.5%	2.5%	8.90%	13.63%	624	62.4
CAES	Developing	14 to 18	21	10%	3%	5%	0.1	0.0005	117	0.01	0	30	30	32%	8%	40%	2.5%	2.5%	2.5%	8.90%	13.63%	247	23.2

Notes:
1. Based on installation of new coal fired capacity. Costs are show as incremental.
2. SO2 emissions are highly variable. Sulfur in bio-gas can range from 100 ppmvd to 12,000 ppmvd.