



2013 Integrated Resource Plan

Supply-side Resource Options

October 31, 2012

Description		Resource Characteristics					Costs						
Fuel	Resource	Elevation (AFSL)	Net Capacity (MW)	Resource	Total	Commercial	Base Capital (\$/KW)	Var O&M (\$/MWh)	Fraction Var	Fraction Var	Fixed O&M (\$/KW-yr)	Fraction Fixed	
				Availability Year	Implementation Time (yrs)	Operation Year			O&M Capitalized	O&M Adjusted by Capacity Changes		O&M Capitalized	
				Year	Time (yrs)	Year			O&M Capitalized	O&M Adjusted by Capacity Changes	Fixed O&M (\$/KW-yr)	O&M Capitalized	
Natural Gas	SCCT Aero x3, ISO	0	163	2012	4	2016	30	1,081	3.50	0.85	0.87	9.88	0.17
Natural Gas	Intercooled SCCT Aero x1, ISO	0	102	2012	4	2016	30	1,004	2.92	0.87	0.88	15.23	0.18
Natural Gas	SCCT Frame "F" x1, ISO	0	203	2012	4	2016	35	679	8.46	0.99	0.99	7.73	0.17
Natural Gas	IC Recips x6, ISO	0	117	2012	4	2016	30	1,204	7.40	0.55	0.73	15.61	0.05
Natural Gas	CCCT Dry "F", 2x1, ISO	0	609	2012	5	2017	40	995	2.11	0.97	0.98	6.13	0.16
Natural Gas	CCCT Dry "F", DF, 2x1, ISO	0	138	2012	5	2017	40	522	0.08	0.00	0.00	0.00	0.00
Natural Gas	CCCT Dry "G/H", 1x1, ISO	0	372	2012	5	2017	40	971	2.53	0.89	0.95	10.70	0.25
Natural Gas	CCCT Dry "G/H", DF, 1x1, ISO	0	48	2012	5	2017	40	612	0.08	0.00	0.00	0.00	0.00
Natural Gas	CCCT Dry "G/H", 2x1, ISO	0	746	2012	5	2017	40	959	2.44	0.92	0.97	5.61	0.24
Natural Gas	CCCT Dry "G/H", DF, 2x1, ISO	0	96	2012	5	2017	40	600	0.07	0.00	0.00	0.00	0.00
Natural Gas	CCCT Dry "J", Adv 1x1, ISO	0	439	2013	5	2018	40	931	2.20	0.89	0.95	9.13	0.25
Natural Gas	CCCT Dry "J", DF, Adv 1x1, ISO	0	43	2013	5	2018	40	486	0.08	0.00	0.00	0.00	0.00
Natural Gas	Intercooled SCCT Aero x1	1,500	99	2012	4	2016	30	1,034	2.99	0.87	0.88	15.67	0.18
Natural Gas	SCCT Frame "F" x1	1,500	197	2012	4	2016	35	699	8.71	0.99	0.99	7.97	0.17
Natural Gas	IC Recips x 6	1,500	112	2012	4	2016	30	1,253	7.63	0.57	0.76	16.31	0.05
Natural Gas	CCCT Dry "F", 2x1	1,500	583	2012	4	2016	40	1,039	2.18	0.97	0.97	6.43	0.16
Natural Gas	CCCT Dry "F", DF, 2x1	1,500	138	2012	4	2016	40	522	0.08	0.00	0.00	0.00	0.00
Natural Gas	CCCT Dry "G/H", 2x1	1,500	715	2012	5	2017	40	1,000	2.54	0.92	0.97	5.86	0.24
Natural Gas	CCCT Dry "G/H", DF, 2x1	1,500	96	2012	5	2017	40	600	0.07	0.00	0.00	0.00	0.00
Natural Gas	CCCT Dry "J", Adv 1x1	1,500	425	2013	5	2018	40	962	2.27	0.89	0.95	9.43	0.25
Natural Gas	CCCT Dry "J", DF, Adv 1x1	1,500	43	2013	5	2018	40	486	0.08	0.00	0.00	0.00	0.00
Natural Gas	SCCT Aero x3	4,250	144	2012	4	2016	30	1,225	3.89	0.85	0.87	11.11	0.17
Natural Gas	Intercooled SCCT Aero x1	4,250	91	2012	4	2016	30	1,127	3.23	0.87	0.88	16.97	0.18
Natural Gas	SCCT Frame "F" x1	4,250	181	2012	4	2016	35	762	9.48	0.99	0.99	8.67	0.17
Natural Gas	IC Recips x6	4,250	103	2012	4	2016	30	1,368	8.15	0.57	0.76	18.39	0.05
Natural Gas	CCCT Wet "F", 2x1	4,250	545	2012	5	2017	40	1,104	2.87	0.79	0.92	8.58	0.09
Natural Gas	CCCT Wet "F", DF, 2x1	4,250	89	2012	5	2017	40	490	0.32	0.00	0.00	0.00	0.00
Natural Gas	CCCT Dry "F", 1x1	5,050	255	2012	5	2017	40	1,253	2.57	0.95	0.95	13.94	0.16
Natural Gas	CCCT Dry "F", DF, 1x1	5,050	48	2012	5	2017	40	546	0.08	0.00	0.00	0.00	0.00
Natural Gas	CCCT Dry "F", 2x1	5,050	523	2012	5	2017	40	1,159	2.42	0.97	0.97	7.14	0.16
Natural Gas	CCCT Dry "F", DF, 2x1	5,050	138	2012	5	2017	40	522	0.08	0.00	0.00	0.00	0.00
Natural Gas	CCCT Dry "G/H", 1x1	5,050	320	2012	5	2017	40	1,129	2.94	0.88	0.94	12.45	0.25
Natural Gas	CCCT Dry "G/H", DF, 1x1	5,050	48	2012	5	2017	40	612	0.08	0.00	0.00	0.00	0.00
Natural Gas	CCCT Dry "G/H", 2x1	5,050	640	2012	5	2017	40	1,118	2.82	0.92	0.97	6.55	0.24
Natural Gas	CCCT Dry "G/H", DF, 2x1	5,050	96	2012	5	2017	40	600	0.07	0.00	0.00	0.00	0.00
Natural Gas	CCCT Dry "J", Adv 1x1	5,050	380	2013	5	2018	40	1,075	2.54	0.88	0.95	10.54	0.25
Natural Gas	CCCT Dry "J", DF, Adv 1x1	5,050	43	2013	5	2018	40	486	0.08	0.00	0.00	0.00	0.00
Natural Gas	SO Fuel Cell	4,500	5	2015	3	2018	20	2,090	0.03	0.89	0.94	8.82	0.12
Natural Gas	Intercooled SCCT Aero x1	6,500	86	2012	4	2016	30	1,189	3.39	0.87	0.88	17.91	0.18
Natural Gas	SCCT Frame "F" x1	6,500	172	2012	4	2016	35	804	10.00	0.99	0.99	9.13	0.17
Natural Gas	IC Recips x6	6,500	96	2012	4	2016	30	1,469	8.60	0.57	0.76	19.03	0.05
Natural Gas	CCCT Dry "G/H", 2x1	6,500	617	2012	5	2017	40	1,159	2.92	0.92	0.97	6.80	0.24
Natural Gas	CCCT Dry "G/H", DF, 2x1	6,500	96	2012	5	2017	40	600	0.07	0.00	0.00	0.00	0.00
Natural Gas	CCCT Dry "J", Adv 1x1	6,500	368	2013	5	2018	40	1,110	2.62	0.88	0.94	10.88	0.25
Natural Gas	CCCT Dry "J", DF, Adv 1x1	6,500	43	2013	5	2018	40	486	0.08	0.00	0.00	0.00	0.00

Description		Operating Characteristics					Environmental				PaR Model Inputs				
		Average Full Load Heat Rate (HHV Btu/KWh)/Efficiency	EFOR (%)	POR (%)	Heat Input for Warm Start (HHV, MMBtu)	Water Consumed (Gal/MWh)	SO2 (lbs/MMBtu)	NOx (lbs/MMBtu)	Hg (lbs/TBTu)	CO2 (lbs/MMBtu)	Minimum Capacity (per SC machine, per CCCT config,% capacity)	Minimum Capacity (per SC machine, per CCCT config, MW)	Spinning Reserves (per SC machine, per CCCT config, MW)	Run-up Rate (first fire to min capacity, warm start, MW/hr)	Ramp Rate (min capacity to full load, warm start, MW/hr)
Fuel	Resource														
Natural Gas	SCCT Aero x3, ISO	9,739	2.6	3.9	153	56	0.0006	0.018	0.255	118	33%	18	37	133	886
Natural Gas	Intercooled SCCT Aero x1, ISO	8,867	2.9	3.9	93	78	0.0006	0.018	0.255	118	25%	26	77	204	480
Natural Gas	SCCT Frame "F" x1, ISO	9,950	2.7	3.9	100	10	0.0006	0.018	0.255	118	40%	81	122	487	780
Natural Gas	IC Recips x6, ISO	8,447	2.5	5.0	31	5	0.0006	0.018	0.255	118	50%	10	10	130	780
Natural Gas	CCCT Dry "F", 2x1, ISO	6,738	2.5	3.8	3,866	11	0.0006	0.007	0.255	118	55%	335	250	351	1500
Natural Gas	CCCT Dry "F", DF, 2x1, ISO	8,482	0.8	3.8	42	11	0.0006	0.007	0.255	118	15%	21	41	248	248
Natural Gas	CCCT Dry "G/H", 1x1, ISO	6,866	2.5	3.8	2,479	11	0.0006	0.008	0.255	118	58%	216	156	209	1320
Natural Gas	CCCT Dry "G/H", DF, 1x1, ISO	8,262	0.8	3.8	39	11	0.0006	0.008	0.255	118	15%	7	14	86	86
Natural Gas	CCCT Dry "G/H", 2x1, ISO	6,743	2.5	3.8	3,305	11	0.0006	0.008	0.255	118	58%	433	313	420	2700
Natural Gas	CCCT Dry "G/H", DF, 2x1, ISO	8,105	0.8	3.8	39	11	0.0006	0.008	0.255	118	15%	14	29	173	173
Natural Gas	CCCT Dry "J", Adv 1x1, ISO	6,495	2.5	3.8	3,062	11	0.0006	0.008	0.255	118	50%	219	200	239	1200
Natural Gas	CCCT Dry "J", DF, Adv 1x1, ISO	8,611	0.8	3.8	31	11	0.0006	0.008	0.255	118	15%	6	13	77	77
Natural Gas	Intercooled SCCT Aero x1	8,839	2.9	3.9	93	80	0.0006	0.018	0.255	118	25%	25	33	198	198
Natural Gas	SCCT Frame "F" x1	9,950	2.7	3.9	100	20	0.0006	0.018	0.255	118	40%	79	79	474	474
Natural Gas	IC Recips x 6	8,447	2.5	3.8	31	5	0.0006	0.030	0.255	118	50%	9	9	125	125
Natural Gas	CCCT Dry "F", 2x1	6,738	2.5	3.8	3866	11	0.0006	0.008	0.255	118	55%	53	9	56	56
Natural Gas	CCCT Dry "F", DF, 2x1	8,482	0.8	3.8	42	11	0.0006	0.008	0.255	118	15%	3	7	41	41
Natural Gas	CCCT Dry "G/H", 2x1	6,773	2.5	3.8	3,305	9	0.0006	0.008	0.255	118	58%	415	300	402	2700
Natural Gas	CCCT Dry "G/H", DF, 2x1	8,135	0.8	3.8	42	9	0.0006	0.008	0.255	118	15%	14	29	173	173
Natural Gas	CCCT Dry "J", Adv 1x1	6,495	2.5	3.8	3,062	9	0.0006	0.008	0.255	118	50%	212	200	232	1200
Natural Gas	CCCT Dry "J", DF, Adv 1x1	8,611	0.8	3.8	17	9	0.0006	0.008	0.255	118	15%	6	13	77	77
Natural Gas	SCCT Aero x3	9,739	2.6	3.9	153	58	0.0006	0.018	0.255	118	33%	16	32	117	886
Natural Gas	Intercooled SCCT Aero x1	8,867	2.9	3.9	93	80	0.0006	0.018	0.255	118	25%	23	68	182	480
Natural Gas	SCCT Frame "F" x1	9,950	2.7	3.9	100	20	0.0006	0.018	0.255	118	40%	72	109	434	780
Natural Gas	IC Recips x6	8,447	2.5	5.0	31	5	0.0006	0.030	0.255	118	50%	9	9	114	780
Natural Gas	CCCT Wet "F", 2x1	6,666	2.5	3.8	3,830	200	0.0006	0.007	0.255	118	55%	300	245	360	1620
Natural Gas	CCCT Wet "F", DF, 2x1	7,901	0.8	3.8	42	200	0.0006	0.007	0.255	118	15%	13	27	160	160
Natural Gas	CCCT Dry "F", 1x1	6,815	2.5	3.8	2,900	9	0.0006	0.007	0.255	118	55%	140	115	180	720
Natural Gas	CCCT Dry "F", DF, 1x1	8,518	0.8	3.8	39	9	0.0006	0.007	0.255	118	15%	7	14	86	86
Natural Gas	CCCT Dry "F", 2x1	6,738	2.5	3.8	3,866	9	0.0006	0.008	0.255	118	55%	288	235	302	1500
Natural Gas	CCCT Dry "F", DF, 2x1	8,482	0.8	3.8	78	9	0.0006	0.008	0.255	118	15%	21	41	248	248
Natural Gas	CCCT Dry "G/H", 1x1	6,866	2.5	3.8	2,479	9	0.0006	0.008	0.255	118	58%	186	134	180	1320
Natural Gas	CCCT Dry "G/H", DF, 1x1	8,262	0.8	3.8	21	9	0.0006	0.008	0.255	118	15%	7	14	86	86
Natural Gas	CCCT Dry "G/H", 2x1	6,743	2.5	3.8	3,305	9	0.0006	0.008	0.255	118	58%	371	269	360	2700
Natural Gas	CCCT Dry "G/H", DF, 2x1	8,105	0.8	3.8	39	9	0.0006	0.008	0.255	118	15%	14	29	173	173
Natural Gas	CCCT Dry "J", Adv 1x1	6,495	2.5	3.8	3,062	9	0.0006	0.008	0.255	118	50%	190	190	207	1200
Natural Gas	CCCT Dry "J", DF, Adv 1x1	8,611	0.8	3.8	17	9	0.0006	0.008	0.255	118	15%	6	13	77	77
Natural Gas	SO Fuel Cell	8,061	3	2	1	2	0.0006	0	0.255	118	50%	3	3	117	117
Natural Gas	Intercooled SCCT Aero x1	8,867	2.9	3.9	93	80	0.0006	0.018	0.255	118	25%	22	65	172	480
Natural Gas	SCCT Frame "F" x1	9,950	2.7	3.9	100	20	0.0006	0.018	0.255	118	40%	69	103	412	780
Natural Gas	IC Recips x6	8,447	2.5	5.0	31	5	0.0006	0.0295	0.255	118	50%	8	8	107	780
Natural Gas	CCCT Dry "G/H", 2x1	6,743	2.5	3.8	3,305	9	0.0006	0.008	0.255	118	58%	358	259	347	2700
Natural Gas	CCCT Dry "G/H", DF, 2x1	8,105	0.8	3.8	39	9	0.0006	0.008	0.255	118	15%	14	29	173	173
Natural Gas	CCCT Dry "J", Adv 1x1	6,495	2.5	3.8	3,062	9	0.0006	0.008	0.255	118	50%	184	184	201	1200
Natural Gas	CCCT Dry "J", DF, Adv 1x1	8,611	0.8	3.8	17	9	0.0006	0.008	0.255	118	15%	6	13	77	77

Description		Resource Characteristics						Costs					
		Elevation (AFSL)	Net Capacity (MW)	Resource Availability	Total Implementation	Commercial Operation	Design Life	Base Capital (\$/KW)	Var O&M (\$/MWh)	Fraction Var	Fraction Var	Fixed O&M (\$/KW-yr)	Fraction Fixed
Year	Time (yrs)			Year	Year	O&M Capitalized	O&M Adjusted by Capacity Changes			O&M Capitalized			
Fuel	Resource												
Coal	SCPC with CCS	4,500	526	2025	7	2032	40	5,410	6.71	0.00	0.00	69.22	0.38
Coal	SCPC without CCS	4,500	600	2020	7	2027	40	2,992	0.96	0.00	0.00	40.65	0.38
Coal	IGCC with CCS	4,500	466	2025	7	2032	40	5,238	11.28	0.79	0.00	55.78	0.00
Coal	IGCC without CCS	4,500	560	2020	7	2027	40	3,734	8.39	0.79	0.00	42.45	0.00
Coal	PC CCS retrofit @ 500 MW	4,500	-139	2025	4	2029	20	1,188	6.20	0.00	0.00	74.52	0.38
Coal	SCPC with CCS	6,500	692	2025	7	2032	40	6,126	7.26	0.00	0.00	64.29	0.38
Coal	SCPC without CCS	6,500	790	2020	7	2027	40	3,388	1.27	0.00	0.00	37.71	0.38
Coal	IGCC with CCS	6,500	456	2025	7	2032	40	5,931	13.52	0.79	0.00	60.76	0.00
Coal	IGCC without CCS	6,500	548	2020	7	2027	40	4,228	10.06	0.79	0.00	46.24	0.00
Coal	PC CCS retrofit @ 500 MW	6,500	-139	2025	4	2029	20	1,345	6.71	0.00	0.00	69.22	0.38
Geothermal	Blundell Dual Flash 90% CF	4,500	35	2012	4	2016	40	4,795	0.98	0.00	0.00	118.49	0.10
Geothermal	Greenfield Binary 90% CF	4,500	43	2012	6	2018	40	5,916	0.98	0.00	0.00	187.85	0.10
Geothermal	Generic Geothermal PPA 90% CF	4,500	30	2012	4	2016	20	n/a	110.00	n/a	n/a	n/a	n/a
Wind	2.3 MW turbine 29% CF WA	1,500	100	2012	5	2017	25	2,365	0.00	0.00	0.00	33.11	0.09
Wind	2.3 MW turbine 29% CF UT	4,500	100	2012	5	2017	25	2,304	0.00	0.00	0.00	33.11	0.09
Wind	2.3 MW turbine 35% CF WY	6,500	100	2012	5	2017	25	2,138	0.65	0.00	0.00	33.11	0.09
Wind	2.3 MW turbine 40% CF WY	6,500	200	2012	5	2017	25	2,257	0.65	0.00	0.00	33.11	0.09
Solar	PV Thin Film 21% CF	4,500	2	2012	2	2014	25	3,476	0.00	0.00	0.00	51.50	0.20
Solar	PV Poly-Si Fixed Tilt 22% CF (1.21 MWdc/MWac)	4,500	2	2012	2	2014	25	3,153	0.00	0.00	0.00	51.50	0.20
Solar	PV Poly-Si Single Tracking 25% CF (1.21 MWdc/MWac)	4,500	2	2012	2	2014	25	3,810	0.00	0.00	0.00	67.00	0.20
Solar	PV Poly-Si Fixed Tilt 28% CF (1.37 MWdc/MWac)	4,500	50	2012	3	2015	25	2,952	0.00	0.00	0.00	27.76	0.20
Solar	PV Poly-Si Single Tracking 33% CF (1.34 MWdc/MWac)	4,500	50	2012	3	2015	25	3,176	0.00	0.00	0.00	32.49	0.20
Solar	CSP Trough w Natural Gas	4,500	100	2012	3	2015	30	5,072	0.00	0.00	0.00	64.00	0.38
Solar	CSP Tower 24% CF	4,500	100	2012	3	2015	30	4,831	0.00	0.00	0.00	64.00	0.38
Solar	CSP Tower Molten Salt 30% CF	4,500	100	2012	3	2015	30	5,796	0.00	0.00	0.00	64.00	0.38
Water	Hydrokinetic/Wave 40% CF	0	100	2020	4	2024	20	5,539	0.00	0.00	0.00	166.17	0.50
Biomass	Forestry Byproduct	1,500	5	2012	5	2017	30	3,334	0.96	0.00	0.00	40.65	0.38
Storage	Pumped Storage	4,500	1,000	2012	10	2022	50	3,000	4.30	0.00	0.00	4.30	0.38
Storage	Lithium Ion Battery	4,500	10	2012	3	2015	20	8,712	0.00	0.00	0.00	27.40	0.00
Storage	Sodium-Sulfur Battery	4,500	10	2012	3	2015	20	4,400	0.00	0.00	0.00	27.40	0.00
Storage	Vanadium RedOx Battery	4,500	10	2012	3	2015	20	5,530	0.00	0.00	0.00	36.53	0.00
Storage	Advanced Fly Wheel	4,500	10	2012	3	2015	20	2,406	0.00	0.00	0.00	96.24	0.00
Storage	CAES	4,500	557	2012	5	2017	30	1,751	22.51	0.77	0.58	33.80	0.00
Nuclear	Advanced Fission	4,500	2,236	2015	10	2025	40	7,093	2.04	0.00	0.00	88.75	0.38
Nuclear	Modular Reactor	4,500	25	2020	10	2030	40	3,390	1.02	0.00	0.00	44.38	0.75

Description		Operating Characteristics					Environmental				PaR Model Inputs				
		Average Full Load Heat Rate (HHV Btu/KWh)/Efficiency	EFOR (%)	POR (%)	Heat Input for Warm Start (HHV, MMBtu)	Water Consumed (Gal/MWh)	SO2 (lbs/MMBtu)	NOx (lbs/MMBtu)	Hg (lbs/TBTu)	CO2 (lbs/MMBtu)	Minimum Capacity (per SC machine, per CCCT config, % capacity)	Minimum Capacity (per SC machine, per CCCT config, MW)	Spinning Reserves (per SC machine, per CCCT config, MW)	Run-up Rate (first fire to min capacity, warm start, MW/hr)	Ramp Rate (min capacity to full load, warm start, MW/hr)
Fuel	Resource														
Coal	SCPC with CCS	13,087	5	5	4,441	1,004	0.009	0.070	0.022	20.5	45%	237	80	360	480
Coal	SCPC without CCS	9,106	4.6	4	3,553	600	0.005	0.070	0.022	205.4	35%	210	80	360	480
Coal	IGCC with CCS	10,823	8	7	5,316	394	0.009	0.050	0.333	20.5	45%	210	125	48	750
Coal	IGCC without CCS	8,734	8	7	4,253	361	0.013	0.059	0.333	205.4	35%	196	125	48	750
Coal	PC CCS retrofit @ 500 MW	14,372	5	5	2,450	1,004	0.005	0.070	1.200	20.5	40%	(56)	70	300	420
Coal	SCPC with CCS	13,242	5	5	5,843	1,004	0.009	0.070	0.022	20.5	45%	311	80	360	480
Coal	SCPC without CCS	9,214	4.6	4	4,678	600	0.005	0.070	0.022	205.4	35%	277	80	360	480
Coal	IGCC with CCS	11,047	8	7	5,316	394	0.009	0.050	0.333	20.5	45%	205	125	48	750
Coal	IGCC without CCS	8,915	8	7	4,253	361	0.013	0.059	0.333	205.4	35%	192	125	48	750
Coal	PC CCS retrofit @ 500 MW	14,372	5	5	2,450	1,004	0.005	0.070	1.200	20.5	40%	(56)	70	300	420
Geothermal	Blundell Dual Flash 90% CF	na	5	5	na	1453	0	0	0	0	17%	6.1	15	90	90
Geothermal	Greenfield Binary 90% CF	na	5	5	na	1453	0	0	0	0	40%	17.2	15	90	90
Geothermal	Generic Geothermal PPA 90% CF	na	5	5	na	1453	0	0	0	0	17%	6	15	90	90
Wind	2.3 MW turbine 29% CF WA	0	Included with CF		na	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Wind	2.3 MW turbine 29% CF UT	0	Included with CF		na	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Wind	2.3 MW turbine 35% CF WY	0	Included with CF		na	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Wind	2.3 MW turbine 40% CF WY	0	Included with CF		na	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Solar	PV Thin Film 21% CF	na	Included with CF		na	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Solar	PV Poly-Si Fixed Tilt 22% CF (1.21 MWdc/MWac)	na	Included with CF		na	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Solar	PV Poly-Si Single Tracking 25% CF (1.21 MWdc/MWac)	na	Included with CF		na	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Solar	PV Poly-Si Fixed Tilt 28% CF (1.37 MWdc/MWac)	na	Included with CF		na	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Solar	PV Poly-Si Single Tracking 33% CF (1.34 MWdc/MWac)	na	Included with CF		na	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Solar	CSP Trough w Natural Gas	11,750	Included with CF		na	725	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Solar	CSP Tower 24% CF	na	Included with CF		na	725	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Solar	CSP Tower Molten Salt 30% CF	na	Included with CF		na	750	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Water	Hydrokinetic/Wave 40% CF	na	na	na	na	0	0	0	0	0	n/a	n/a	n/a	0	0
Biomass	Forestry Byproduct	10,017	5.06	4.4	3,908	660	0.1	0.2	0.4	205	50%	3	5	228	228
Storage	Pumped Storage	77.5%	3	1.9	na	0	0	0	0	0	0%	0	1,000	3120	6000
Storage	Lithium Ion Battery	91.0%	3	1.9	na	0	0	0	0	0	n/a	n/a	10	2100	1500
Storage	Sodium-Sulfur Battery	72.5%	0.3	0	na	0	0	0	0	0	n/a	n/a	10	2100	1500
Storage	Vanadium RedOx Battery	70.0%	2	0	na	0	0	0	0	0	n/a	n/a	10	2100	1500
Storage	Advanced Fly Wheel	85.0%	2	0	na	0	0	0	0	0	n/a	n/a	10	2100	1500
Storage	CAES	83.5%	3.5	3.5	na	0	0.001	0.011	0.255	118	50%	279	557	234	886
Nuclear	Advanced Fission	10,710	7.7	7.3	na	767	0	0	0	0	10%	224	2,236	360	360
Nuclear	Modular Reactor	10,710	7.7	7.3	na	767	0	0	0	0	10%	3	25	360	360

Glossary of Terms (column labels)

Fuel:	primary fuel used for electricity generation or storage.
Resource:	primary technology used for electricity generation or storage.
Elevation (afsl):	average feet above sea level for the proxy site for the given resource. 1500' is considered a proxy for a site in the Pacific Northwest (Washington, Oregon). 4250'/4500' is considered a proxy for a northern Utah site or eastern Oregon/Washington site. 6500' is considered a proxy for a site in southwest or central Wyoming.
Net Capacity (MW):	net dependable capacity is the net electrical output for a given technology at the given elevation and annual average ambient temperature, in a "new and clean" condition.
Resource Availability Year:	year the resource is first commercially available to begin development; if available prior to the development of this database, default to current year of database.
Total Implementation Time:	number of years necessary to implement all phases of resource development and construction - site selection, permitting, maintenance contracts, IRP approval RFP process, owner's engineering, construction, testing.
Commercial Operation Year:	year the resource is available for generation and dispatch.
Design Life (yrs):	average number of years the resource is expected to be "used and useful", based on various inputs such as the OEM's guarantee, fuel availability, and environmental regulations.
Base Capital (\$/KW):	total capital expenditure in \$/KW for the development and construction of a resource, including direct costs (equipment, buildings, installation/overnight construction, testing, EPC fees/profit, and contingency), owner's costs (land acquisition, water rights, air permitting, design engineering, spare parts, project management costs, legal/financial costs, grid interconnection costs, and contingency), and financial costs (AFUDC, capital surcharge, property taxes, and escalation).
Var O&M (\$/MWh):	includes real levelized variable operating costs such as combustion turbine maintenance, raw water costs, boiler water/circulating water treatment chemicals, pollution control chemicals, equipment maintenance chemicals, and fired hour fee.
% Variable O&M Capitalized:	percent of variable costs capitalized: fired hour fee, combustion turbine/overhauls, Nox/CO catalyst. Does not include steam turbine inspection/overhaul or generator inspection/overhaul costs.
% VOM Adjusted by Capacity Changes:	percent of total variable costs that are impacted by elevation-based capacity changes, which are all non routine variable costs - combustion turbine maintenance, fired hour fee, catalyst replacements.
Fixed O&M (\$/KW-yr):	includes fixed operating costs: labor costs, combustion turbine fixed maintenance fees, contracted services fees, office equipment, training.
% Fixed O&M Capitalized (includes Ongoing Capital):	percent of variable costs that can be capitalized - contracted services fees, spares, and office equipment.
Average Full Load Heat Rate HHV (Btu/KWh):	efficiency of a resource to generate electricity for a given heat input in a "new and clean" condition.
EFOR (%):	projected equivalent forced outage rate, which includes forced outages and derates, for a given resource at the given site.
POR (%):	projected planned outage rate for a given resource at the given site.
Heat Input for Warm Start (MMBtu):	heat input in higher heating value million Btu's necessary to bring a given resource from first fire up to minimum capacity after the resource has not been operating for more than 8 hours but less than 72 hours for a natural gas resource. Assumed no minimum capacity for duct firing.
Water Consumed (gal/MWh):	average amount of water consumed by a resource for prime mover make-up, cooling water make-up, inlet conditioning, and pollution control
SO ₂ (lbs/MMBtu):	expected permitted pounds of sulfur dioxide emitted per million Btu.
NO _x (lbs/MMBtu):	expected permitted pounds of nitrogen dioxide emitted per million Btu, as either NO, N ₂ O, or NO ₂ .
Hg (lbs/Tbtu):	expected permitted pounds of mercury emitted per trillion Btu.
CO ₂ (lbs/MMBtu):	pounds of carbon dioxide emitted per million Btu.

Glossary of Acronyms

Adv:	Advanced (Combined Cycle Combustion Turbine)
AFSL:	Average Feet (Above) Sea Level
CAES:	Compressed Air Energy Storage
CCCT:	Combined Cycle Combustion Turbine
CCS:	Carbon Capture and Sequestration
CF:	Capacity Factor
CSP:	Concentrated Solar Power
DF:	Duct Firing
IC:	Internal Combustion
IGCC:	Integrated Gasification Combined Cycle
ISO:	International Organization for Standardization (Temp = 59 F/15 C, Pressure = 14.7 psia/1.013 bar)
PC CCS:	Pulverized Coal -Carbon Capture and Sequestration
PV Poly-Si:	Photovoltaic Solar Cells constructed from poly-crystalline silicon semiconductor wafers
Recips:	Reciprocating Engine
SCCT:	Simple Cycle Combustion Turbine
SCPC:	Super-Critical Pulverized Coal
SO:	Solid Oxide (Fuel Cell)

Solar PV Total Cost: Year-On-Year Percentages

Year	1 MW, Fixed Tilt	1MW, Single Axis Tracking	100 MW, Fixed Tilt	100 MW, Single Axis Tracking
2012				
2013	98.53%	98.23%	99.46%	99.64%
2014	98.51%	98.20%	99.46%	99.64%
2015	98.49%	98.17%	99.47%	99.64%
2016	99.27%	98.49%	99.47%	99.65%
2017	99.27%	98.47%	99.56%	99.65%
2018	99.27%	98.45%	99.57%	99.66%
2019	99.27%	98.43%	99.57%	99.66%
2020	99.27%	98.41%	99.58%	99.67%
2021	99.46%	99.32%	99.58%	99.67%
2022	99.46%	99.32%	99.59%	99.84%
2023	99.47%	99.32%	99.59%	99.85%
2024	99.47%	99.32%	99.60%	99.85%
2025	99.47%	99.32%	99.60%	99.86%
2026	99.54%	99.70%	99.61%	99.87%
2027	99.54%	99.71%	99.81%	99.79%
2028	99.54%	99.71%	99.82%	99.80%
2029	99.55%	99.72%	99.82%	99.81%
2030	99.55%	99.72%	99.83%	99.81%
2031	99.62%	99.79%	99.84%	99.82%