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Appendix A. Simulation results which give positive NPV (only results with lowest 20 LCOE)

Table A-1: Parameter sets used for parametric simulation in both models

PPA price (\$/ kWh)	Number of field subsections	Solar multiple	Full load hours of TES (hr)
0.3	2	2	0
0.5	4	4	4
0.7	6	6	8
0.9	8	8	12
1		10	16
			20

Table A-2: Simulation results of Case 1 for runs by which give positive NPV

Run	PPA price (\$/ kWh)	Number of field subsections	Solar multiple	Full load hours of TES (hr)	Annual Energy (kWh)	Capacity factor (%)	Net present value (after-tax) (\$)	IRR at end of analysis period (%)	Net capital cost per watt (\$/W)	Levelized cost (real) (cents/ kWh)
442	0.5	2	6	16	6.49E+07	74.86	2.27E+07	14.82	26.87	32.99
443	0.7	2	6	16	6.49E+07	74.86	1.29E+08	27.42	26.87	33.39
542	0.5	2	6	20	6.76E+07	77.93	1.98E+07	14.31	28.62	33.48
444	0.9	2	6	16	6.49E+07	74.86	2.34E+08	20.29	26.87	33.79
543	0.7	2	6	20	6.76E+07	77.93	1.30E+08	26.63	28.62	33.87
445	1	2	6	16	6.49E+07	74.86	2.87E+08	24.18	26.87	33.99
544	0.9	2	6	20	6.76E+07	77.93	2.40E+08	18.72	28.62	34.27
545	1	2	6	20	6.76E+07	77.93	2.95E+08	22.90	28.62	34.47
322	0.5	2	4	12	4.76E+07	54.89	5.78E+06	13.00	20.03	34.95
562	0.5	2	8	20	7.47E+07	86.11	8.88E+06	12.90	33.70	34.97
222	0.5	2	4	8	4.39E+07	50.63	4.49E+06	12.86	18.28	35.11
342	0.5	2	6	12	5.74E+07	66.19	5.86E+06	12.81	25.11	35.11
462	0.5	2	8	16	7.04E+07	81.23	5.36E+06	12.58	31.95	35.33
323	0.7	2	4	12	4.76E+07	54.89	8.34E+07	25.59	20.03	35.34
563	0.7	2	8	20	7.47E+07	86.11	1.31E+08	24.48	33.70	35.37
223	0.7	2	4	8	4.39E+07	50.63	7.61E+07	25.64	18.28	35.51
343	0.7	2	6	12	5.74E+07	66.19	9.95E+07	24.84	25.11	35.51
463	0.7	2	8	16	7.04E+07	81.23	1.20E+08	24.14	31.95	35.73
324	0.9	2	4	12	4.76E+07	54.89	1.61E+08	17.14	20.03	35.74
447	0.5	4	6	16	5.97E+07	68.87	1.59E+06	12.23	26.86	35.76

Table A-3: Simulation results of Case 2 for runs by which give positive NPV

Run	PPA price (\$/kWh)	Number of field subsections	Solar multiple	Full load hours of TES (hr)	Annual Energy (kWh)	Capacity factor (%)	Net present value (after-tax) (\$)	IRR in target year (%)	Net capital cost (\$)	Net capital cost per watt (\$/W)	Levelized cost (real) (cents/kWh)
563	0.7	2	8	20	5.24E+07	60.46	7.84E+06	11.5	3.29E+08	33.2241	49.10
564	0.9	2	8	20	5.24E+07	60.46	9.34E+07	20.62	3.29E+08	33.2241	49.50
565	1	2	8	20	5.24E+07	60.46	1.36E+08	24.87	3.29E+08	33.2241	49.70
443	0.7	2	6	16	4.22E+07	48.70	2.47E+06	10.97	2.62E+08	26.4871	49.88
444	0.9	2	6	16	4.22E+07	48.70	7.14E+07	20.30	2.62E+08	26.4871	50.28
463	0.7	2	8	16	4.87E+07	56.21	3.73E+05	10.64	3.12E+08	31.498	50.32
445	1	2	6	16	4.22E+07	48.70	1.06E+08	24.62	2.62E+08	26.4871	50.48
464	0.9	2	8	16	4.87E+07	56.21	7.99E+07	19.71	3.12E+08	31.498	50.72
465	1	2	8	16	4.87E+07	56.21	1.20E+08	23.91	3.12E+08	31.498	50.91
344	0.9	2	6	12	3.89E+07	44.86	6.05E+07	19.46	2.45E+08	24.7611	51.44
345	1	2	6	12	3.89E+07	44.86	9.22E+07	23.76	2.45E+08	24.7611	51.64
544	0.9	2	6	20	4.30E+07	49.54	6.32E+07	18.73	2.79E+08	28.2129	52.16
545	1	2	6	20	4.30E+07	49.54	9.82E+07	22.91	2.79E+08	28.2129	52.35
584	0.9	2	10	20	5.72E+07	65.96	7.61E+07	17.51	3.95E+08	39.9049	53.36
224	0.9	2	4	8	2.86E+07	32.94	3.74E+07	18.33	1.78E+08	18.0241	53.53
585	1	2	10	20	5.72E+07	65.96	1.23E+08	21.46	3.95E+08	39.9049	53.56
225	1	2	4	8	2.86E+07	32.94	6.07E+07	22.74	1.78E+08	18.0241	53.73
569	0.9	4	8	20	4.67E+07	53.89	5.17E+07	16.31	3.29E+08	33.2234	55.29
570	1	4	8	20	4.67E+07	53.89	8.98E+07	20.25	3.29E+08	33.2234	55.49
364	0.9	2	8	12	4.20E+07	48.38	4.36E+07	16.02	2.95E+08	29.7716	55.85

Appendix B. Parameter combinations of lowest 20 LCOE (in both models), and selected data set for energy/ power analysis

Table B-1: Parameter combinations which give lowest 20 LCOE

Case 2					Case 1				
Run	PPA price (\$/kWh)	Number of field subsections	Solar multiple	Full load hours of TES (hr)	Run	PPA price (\$/kWh)	Number of field subsections	Solar multiple	Full load hours of TES (hr)
224	0.9	2	4	8	222	0.5	2	4	8
225	1	2	4	8	223	0.7	2	4	8
344	0.9	2	6	12	322	0.5	2	4	12
345	1	2	6	12	323	0.7	2	4	12
364	0.9	2	8	12	324	0.9	2	4	12
443	0.7	2	6	16	342	0.5	2	6	12
444	0.9	2	6	16	343	0.7	2	6	12
445	1	2	6	16	442	0.5	2	6	16
463	0.7	2	8	16	443	0.7	2	6	16
465	1	2	8	16	444	0.9	2	6	16
464	1	2	8	20	445	1	2	6	16
544	0.9	2	6	20	447	0.5	4	6	16
545	1	2	6	20	462	0.5	2	8	16
563	0.7	2	8	20	463	0.7	2	8	16
564	0.9	2	8	20	542	0.5	2	6	20
565	1	2	8	20	543	0.7	2	6	20
569	0.9	4	8	20	544	0.9	2	6	20
570	1	4	8	20	545	1	2	6	20
584	0.9	2	10	20	562	0.5	2	8	20
585	1	2	10	20	563	0.7	2	8	20

Table B-2: Parameter set after removing PPA price parameter and duplicated combinations

Actual				SWERA			
Run	Number of field subsections	Solar multiple	Full load hours of TES (hr)	Run	Number of field subsections	Solar multiple	Full load hours of TES (hr)
224	2	4	8	222	2	4	8
344	2	6	12	322	2	4	12

Actual				SWERA			
Run	Number of field subsections	Solar multiple	Full load hours of TES (hr)	Run	Number of field subsections	Solar multiple	Full load hours of TES (hr)
364	2	8	12	342	2	6	12
443	2	6	16	442	2	6	16
463	2	8	16	447	4	6	16
464	2	8	20	462	2	8	16
544	2	6	20	542	2	6	20
569	4	8	20	562	2	8	20
584	2	10	20				

Appendix C. The days in which the largest variation in solar radiation occurs

Table C-1: The days in which the largest variation in solar radiation occurs

Large	Day of the year	Day
1	254	11/September/2012
2	93	03/April/2012
3	329	25/November/2012
4	195	14/July/2012
5	225	13/August/2012
6	89	30/March/2012
7	54	23/February/2012
8	317	13/November/2012
9	15	15/January/2012
10	106	16/April/2012

Appendix D. Summary of CSP technology

Table D-1: Comparison summary of CSP technologies

Feature	Parabolic trough	Solar tower	Linear Fresnel	Dish-Stirling
Typical Capacity (MW)	10- 300	10-200	10 - 200	0.01 – 0.025
Maturity of technology	Commercially proven	Pilot Plants, commercial projects under construction	Pilot projects	Demonstration projects
Technology development risk	Low	Medium	Medium	Medium
Operating temperature of solar field (°C)	290 - 550	250 - 650	250 - 390	550 - 750
Plant peak efficiency (%)	14 - 20	23 - 35	~18	~30
Annual solar-to-electricity efficiency (net) (%)	11 - 16	7 - 20	13	12 - 25
Annual capacity factor (%)	25 - 28 (no TES) 29 - 43 (7 h TES)	55 (10 h TES)	22 - 24	25 - 28
Collector concentration	70 - 80 suns	>1000 suns	>60 suns (depends on secondary reflector)	>1300 suns
Receiver/absorber	Absorber attached to collector, moves with collector, complex design	External surface or cavity receiver, fixed	Fixed absorber, no evacuation, secondary reflector	Absorber attached to collector, moves with collector
Storage system	Indirect 2-tank molten salt at 380 °C ($\Delta T = 100$ °C) or Direct 2-tank molten salt at 550 °C ($\Delta T = 300$ °C)	Direct 2-tank molten salt at 550 °C ($\Delta T = 300$ °C)	Short-term pressurized steam storage (<10 min)	No storage, chemical storage under development

Feature	Parabolic trough	Solar tower	Linear Fresnel	Dish-Stirling
Grid stability	Medium to high (TES or hybridization)	High (large TES)	Medium (back-up firing possible)	Low
Cycle	Superheated steam Rankine	Superheated steam Rankine	Saturated steam Rankine	Stirling
Steam conditions (C/bar)	380 to 540/100	540/100 to 160	260/50	n.a.
Water requirement (m ³ / MWh)	3 (wet cooling) 0.3 (dry cooling)		0.25 (dry cooling) 0.2 (dry cooling)	0.05 - 0.1 (mirror washing)
Suitability for air cooling	Low to good	Good	Low	Best
Storage with molten salt	Commercially available	Commercially available	Possible, but not proven	Possible, but not proven

Source: Source: (International Renewable Energy Agency (IRENA), 2012)