California Energy Commission
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Handout Package for March 7, 2013 COG Workshop

California Energy Commission
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Plant Costs and Plant Parameters
Mid-Cost Case; Start-Year = 2013

Technology - Plant Costs Start Year = 2013 (2013 Dollars)	Gross Capacity (MW)	Instant Costs ($/kW)	Installed Costs ($/kW)			Construction Period (%/Year)						Fixed O&M ($/kW-Yr)	Variable O&M ($/MWh)
			Merchant	IOU	POU	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5		
Generation Turbine 49.9 MW	49.9	1,609	1,800	1,816	1,790	100%	0%	0%	0%	0%	0%	28.39	0.00
Generation Turbine 100 MW	100	1,569	1,755	1,771	1,746	100%	0%	0%	0%	0%	0%	27.44	0.00
Generation Turbine - Advanced 200 MW	200	1,151	1,303	1,323	1,292	75%	25%	0%	0%	0%	0%	25.24	0.00
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	1,257	1,429	1,455	1,414	75%	25%	0%	0%	0%	0%	34.56	0.61
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	1,264	1,437	1,463	1,421	75%	25%	0%	0%	0%	0%	34.56	0.61
Biomass Fludized Bed Boiler 50 MW	50	4,985	5,849	5,888	5,654	50%	40%	10%	0%	0%	0%	106.26	5.29
Geothermal Binary 30 MW	30	5,227	6,946	7,072	6,346	20%	20%	18%	16%	5%	20%	89.79	0.00
Geothermal Flash 30 MW	30	5,933	7,608	7,722	7,062	24%	24%	24%	13%	2%	13%	89.79	0.00
Solar Parabolic Trough W/O Storage 250 MW	250	3,782	4,409	4,452	4,293	50%	50%	0%	0%	0%	0%	70.95	0.00
Solar Parabolic Trough With Storage 250 MW	250	5,428	6,328	6,390	6,162	50%	50%	0%	0%	0%	0%	70.95	0.00
Solar Power TowerW/O Storage 100 MW	100	4,130	4,814	4,861	4,688	50%	50%	0%	0%	0%	0%	62.81	0.00
Solar Power Tower With Storage 100 MW 6 HRs	100	5,796	6,756	6,823	6,579	50%	50%	0%	0%	0%	0%	66.25	0.00
Solar Power Tower With Storage 100 MW 11 HRs	100	6,450	7,518	7,593	7,322	50%	50%	0%	0%	0%	0%	66.25	0.00
Solar Photovoltaic (Thin Film) 100 MW	100	2,774	3,140	3,155	3,099	100%	0%	0%	0%	0%	0%	28.55	0.00
Solar Photovoltaic (Single Axis) 100 MW	100	2,754	3,118	3,133	3,076	100%	0%	0%	0%	0%	0%	37.00	0.00
Solar Photovoltaic (Thin Film) 20 MW	20	3,441	3,896	3,915	3,845	100%	0%	0%	0%	0%	0%	28.55	0.00
Solar Photovoltaic (Single Axis) 20 MW	20	3,457	3,914	3,933	3,862	100%	0%	0%	0%	0%	0%	37.00	0.00
Wind - Class 3 100 MW	100	1,934	2,242	2,254	2,210	95%	5%	0%	0%	0%	0%	31.72	8.46
Wind - Class 4 100 MW	100	1,673	1,940	1,950	1,912	95%	5%	0%	0%	0%	0%	31.72	8.46

Technology Input Parameters	Gross Capacity (MW)	Plant Side Losses	Transformer Losses	Transmission Losses	Scheduled Outage Factor	Forced Outage Rate	Capacity Factor	HHV Heat Rate (Btu/kWh)	Degradation (%/Year)		Emission Factors (Lbs/MWh)					
									Capacity	Heat Rate	NOx	VOC	CO	CO2	SOx	PM10
Generation Turbine 49.9 MW	50	3.40%	0.50%	1.77%	2.72%	5.56%	7.50%	10,585	0.05%	0.05%	1.274	0.247	1.680	1239.3	0.059	0.612
Generation Turbine 100 MW	100	3.40%	0.50%	1.77%	3.18%	4.13%	7.50%	10,585	0.05%	0.05%	1.274	0.247	1.680	1239.3	0.059	0.612
Generation Turbine - Advanced 200 MW	200	3.40%	0.50%	1.77%	3.18%	4.13%	11.25%	9,880	0.05%	0.05%	0.301	0.094	0.578	1156.8	0.024	0.189
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	2.90%	0.50%	1.77%	6.02%	2.24%	57.00%	7,250	0.24%	0.24%	0.111	0.038	0.328	848.8	0.008	0.058
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	2.90%	0.50%	1.77%	6.02%	2.24%	57.00%	7,250	0.24%	0.24%	0.120	0.028	0.497	848.8	0.014	0.066
Biomass Fludized Bed Boiler 50 MW	50	4.00%	0.50%	2.74%	7.60%	9.00%	80.70%	14,500	0.10%	0.15%	0.075	0.012	0.105	195.0	0.034	0.100
Geothermal Binary 30 MW	30	11.50%	0.50%	2.74%	4.00%	2.50%	85.00%	34,377	0.50%	3.00%	0.000	0.000	0.000	0.0	0.000	0.000
Geothermal Flash 30 MW	30	17.00%	0.50%	2.74%	4.00%	2.50%	85.00%	34,377	0.50%	3.00%	0.191	0.011	0.058	264.5	0.026	0.000
Solar Parabolic Trough W/O Storage 250 MW	250	10.71%	0.50%	2.74%	2.00%	6.00%	26.50%		0.50%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Parabolic Trough With Storage 250 MW	250	10.71%	0.50%	2.74%	2.00%	6.00%	43.00%		0.50%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Power TowerW/O Storage 100 MW	100	12.00%	0.50%	2.74%	2.00%	6.00%	31.00%		0.50%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Power Tower With Storage 100 MW 6 HRs	100	12.00%	0.50%	2.74%	2.00%	6.00%	40.00%		0.50%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Power Tower With Storage 100 MW 11 HRs	100	12.50%	0.50%	2.74%	2.00%	6.00%	56.00%		0.50%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Thin Film) 100 MW	100	13.50%	0.50%	2.74%	1.50%	0.00%	21.70%		0.95%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Single Axis) 100 MW	100	13.50%	0.50%	2.74%	1.50%	0.00%	26.60%		0.55%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Thin Film) 20 MW	20	13.50%	0.50%	2.74%	1.50%	0.00%	21.70%		0.95%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Single Axis) 20 MW	20	13.50%	0.50%	2.74%	1.50%	0.00%	26.60%		0.55%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Wind - Class 3 100 MW	100	15.00%	0.50%	2.74%	0.00%	1.00%	42.00%		0.30%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Wind - Class 4 100 MW	100	15.00%	0.50%	2.74%	0.00%	1.00%	39.00%		0.30%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000

Plant Costs and Plant Parameters
High-Cost Case ; Start-Year = 2013

Technology - Plant Costs Start Year = 2013 (2013 Dollars)	Gross Capacity (MW)	Instant Costs ($/kW)	Installed Costs ($/kW)			Construction Period (%/Year)						Fixed O&M ($/kW-Yr)	Variable O&M ($/MWh)
			Merchant	IOU	POU	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5		
Generation Turbine 49.9 MW	49.9	2,255	2,642	2,668	2,630	75%	25%	0%	0%	0%	0%	75.16	0.00
Generation Turbine 100 MW	100	2,144	2,511	2,537	2,500	75%	25%	0%	0%	0%	0%	73.55	0.00
Generation Turbine - Advanced 200 MW	200	1,690	2,018	2,048	2,005	50%	40%	10%	0%	0%	0%	69.90	0.00
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	1,441	1,737	1,767	1,724	50%	40%	10%	0%	0%	0%	82.42	1.89
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	1,454	1,753	1,783	1,739	50%	40%	10%	0%	0%	0%	82.42	1.89
Biomass Fludized Bed Boiler 50 MW	50	6,427	8,041	8,110	7,844	33%	33%	33%	0%	0%	0%	100.44	15.86
Geothermal Binary 30 MW	30	6,557	9,598	9,794	9,062	13%	18%	18%	15%	14%	22%	154.78	0.00
Geothermal Flash 30 MW	30	7,888	11,134	11,329	10,592	13%	21%	21%	21%	11%	13%	182.58	0.00
Solar Parabolic Trough W/O Storage 250 MW	250	4,686	5,754	5,814	5,657	40%	40%	20%	0%	0%	0%	98.33	10.57
Solar Parabolic Trough With Storage 250 MW	250	8,055	9,891	9,994	9,723	40%	40%	20%	0%	0%	0%	148.02	10.57
Solar Power TowerW/O Storage 100 MW	100	5,236	6,429	6,496	6,320	40%	40%	20%	0%	0%	0%	91.98	0.00
Solar Power Tower With Storage 100 MW 6 HRs	100	6,945	8,528	8,617	8,384	40%	40%	20%	0%	0%	0%	148.02	10.57
Solar Power Tower With Storage 100 MW 11 HRs	100	7,257	8,911	9,004	8,761	40%	40%	20%	0%	0%	0%	148.02	10.57
Solar Photovoltaic (Thin Film) 100 MW	100	2,988	3,634	3,664	3,584	50%	50%	0%	0%	0%	0%	52.86	0.00
Solar Photovoltaic (Single Axis) 100 MW	100	3,694	4,492	4,530	4,432	50%	50%	0%	0%	0%	0%	52.86	0.00
Solar Photovoltaic (Thin Film) 20 MW	20	4,033	4,904	4,945	4,838	50%	50%	0%	0%	0%	0%	52.86	0.00
Solar Photovoltaic (Single Axis) 20 MW	20	4,946	6,014	6,064	5,933	50%	50%	0%	0%	0%	0%	52.86	0.00
Wind - Class 3 100 MW	100	2,506	3,116	3,146	3,067	45%	45%	10%	0%	0%	0%	31.72	10.57
Wind - Class 4 100 MW	100	2,095	2,605	2,630	2,564	45%	45%	10%	0%	0%	0%	31.72	10.57

Technology Input Parameters	Gross Capacity (MW)	Plant Side Losses	Transformer Losses	Transmission Losses	Scheduled Outage Factor	Forced Outage Rate	Capacity Factor	HHV Heat Rate (Btu/kWh)	Degradation (%/Year)		Emission Factors (Lbs/MWh)					
									Capacity	Heat Rate	NOx	VOC	CO	CO2	SOx	PM10
Generation Turbine 49.9 MW	50	4.20%	0.50%	1.77%	2.72%	5.56%	4.00%	11,890	0.05%	0.20%	2.389	0.462	3.151	1392.1	0.111	1.147
Generation Turbine 100 MW	100	4.20%	0.50%	1.77%	3.18%	4.13%	4.00%	11,890	0.05%	0.20%	2.389	0.462	3.151	1392.1	0.111	1.147
Generation Turbine - Advanced 200 MW	200	4.20%	0.50%	1.77%	3.18%	4.13%	6.00%	10,200	0.05%	0.20%	0.565	0.177	1.084	1194.2	0.046	0.354
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	4.00%	0.50%	1.77%	6.02%	2.24%	40.00%	7,480	0.24%	0.20%	0.158	0.054	0.468	875.8	0.011	0.083
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	4.00%	0.50%	1.77%	6.02%	2.24%	40.00%	7,480	0.24%	0.20%	0.171	0.041	0.709	875.8	0.020	0.095
Biomass Fludized Bed Boiler 50 MW	50	7.00%	0.50%	2.74%	7.60%	9.00%	78.20%	14,500	0.20%	0.20%	0.075	0.012	0.105	40.6	0.034	0.200
Geothermal Binary 30 MW	30	14.50%	0.50%	2.74%	12.00%	2.80%	77.09%	34,633	2.00%	5.00%	0.000	0.000	0.000	180.0	0.000	0.000
Geothermal Flash 30 MW	30	20.00%	0.50%	2.74%	12.00%	2.80%	71.81%	34,633	2.00%	5.00%	0.191	0.011	0.058	397.0	0.026	0.000
Solar Parabolic Trough W/O Storage 250 MW	250	15.00%	0.50%	2.74%	4.00%	8.00%	20.00%		1.40%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Parabolic Trough With Storage 250 MW	250	15.00%	0.50%	2.74%	4.00%	8.00%	41.00%		1.40%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Power TowerW/O Storage 100 MW	100	13.00%	0.50%	2.74%	4.00%	8.00%	30.00%		1.40%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Power Tower With Storage 100 MW 6 HRs	100	13.00%	0.50%	2.74%	4.00%	8.00%	36.00%		1.40%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Power Tower With Storage 100 MW 11 HRs	100	13.00%	0.50%	2.74%	4.00%	8.00%	52.30%		1.40%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Thin Film) 100 MW	100	21.00%	0.50%	2.74%	4.00%	0.00%	18.50%		1.60%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Single Axis) 100 MW	100	21.00%	0.50%	2.74%	4.00%	0.00%	24.00%		1.25%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Thin Film) 20 MW	20	21.00%	0.50%	2.74%	4.00%	0.00%	18.50%		1.60%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Single Axis) 20 MW	20	21.00%	0.50%	2.74%	4.00%	0.00%	24.00%		1.25%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Wind - Class 3 100 MW	100	16.50%		2.74%	0.00%	1.00%	30.00%		0.80%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Wind - Class 4 100 MW	100	16.50%		2.74%	0.00%	1.00%	30.00%		0.80%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000

Plant Costs and Plant Parameters
Low-Cost Case; Start-Year = 2013

Technology - Plant Costs Start Year = 2013 (2013 Dollars)	Gross Capacity (MW)	Instant Costs ($/kW)	Installed Costs ($/kW)			Construction Period (%/Year)						Fixed O&M ($/kW-Yr)	Variable O&M ($/MWh)
			Merchant	IOU	POU	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5		
Generation Turbine 49.9 MW	49.9	1,141	1,216	1,219	1,213	100%	0%	0%	0%	0%	0%	9.98	0.00
Generation Turbine 100 MW	100	1,132	1,207	1,210	1,203	100%	0%	0%	0%	0%	0%	9.66	0.00
Generation Turbine - Advanced 200 MW	200	728	788	793	781	100%	0%	0%	0%	0%	0%	8.93	0.00
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	1,055	1,142	1,151	1,132	100%	0%	0%	0%	0%	0%	13.79	0.19
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	1,054	1,140	1,149	1,131	100%	0%	0%	0%	0%	0%	13.79	0.19
Biomass Fludized Bed Boiler 50 MW	50	3,464	3,757	3,780	3,707	80%	20%	0%	0%	0%	0%	106.26	5.29
Geothermal Binary 30 MW	30	4,368	5,049	5,127	4,880	30%	33%	28%	9%	0%	0%	89.79	0.00
Geothermal Flash 30 MW	30	3,778	4,307	4,366	4,178	34%	42%	19%	5%	0%	0%	86.15	0.00
Solar Parabolic Trough W/O Storage 250 MW	250	3,002	3,272	3,307	3,234	67%	33%	0%	0%	0%	0%	47.58	0.00
Solar Parabolic Trough With Storage 250 MW	250	5,052	5,506	5,566	5,443	67%	33%	0%	0%	0%	0%	47.58	0.00
Solar Power TowerW/O Storage 100 MW	100	3,553	3,873	3,915	3,829	67%	33%	0%	0%	0%	0%	68.72	0.00
Solar Power Tower With Storage 100 MW 6 HRs	100	5,051	5,505	5,565	5,442	67%	33%	0%	0%	0%	0%	47.58	0.00
Solar Power Tower With Storage 100 MW 11 HRs	100	5,964	6,500	6,570	6,426	67%	33%	0%	0%	0%	0%	47.58	0.00
Solar Photovoltaic (Thin Film) 100 MW	100	1,852	2,019	2,034	2,004	100%	0%	0%	0%	0%	0%	17.97	0.00
Solar Photovoltaic (Single Axis) 100 MW	100	2,410	2,627	2,646	2,607	100%	0%	0%	0%	0%	0%	21.15	0.00
Solar Photovoltaic (Thin Film) 20 MW	20	2,185	2,381	2,398	2,363	100%	0%	0%	0%	0%	0%	17.97	0.00
Solar Photovoltaic (Single Axis) 20 MW	20	2,960	3,226	3,249	3,201	100%	0%	0%	0%	0%	0%	21.15	0.00
Wind - Class 3 100 MW	100	1,647	1,816	1,829	1,802	100%	0%	0%	0%	0%	0%	31.72	6.34
Wind - Class 4 100 MW	100	1,422	1,567	1,578	1,555	100%	0%	0%	0%	0%	0%	31.72	6.34

Technology Input Parameters	Gross Capacity (MW)	Plant Side Losses	Transformer Losses	Transmission Losses	Scheduled Outage Factor	Forced Outage Rate	Capacity Factor	HHV Heat Rate (Btu/kWh)	Degradation (%/Year)		Emission Factors (Lbs/MWh)					
									Capacity	Heat Rate	NOx	VOC	CO	CO2	SOx	PM10
Generation Turbine 49.9 MW	50	2.30%	0.50%	1.77%	2.72%	5.56%	14.00%	9,980	0.05%	0.05%	0.682	0.132	0.900	1168.5	0.032	0.328
Generation Turbine 100 MW	100	2.30%	0.50%	1.77%	3.18%	4.13%	14.00%	9,980	0.05%	0.05%	0.682	0.132	0.900	1168.5	0.032	0.328
Generation Turbine - Advanced 200 MW	200	2.30%	0.50%	1.77%	3.18%	4.13%	21.00%	9,600	0.05%	0.05%	0.161	0.051	0.310	1124.0	0.013	0.101
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	2.00%	0.50%	1.77%	6.02%	2.24%	71.00%	7,030	0.24%	0.20%	0.089	0.030	0.264	823.1	0.006	0.047
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	2.00%	0.50%	1.77%	6.02%	2.24%	71.00%	7,030	0.24%	0.20%	0.096	0.023	0.399	823.1	0.011	0.053
Biomass Fludized Bed Boiler 50 MW	50	2.00%	0.50%	2.74%	0.00%	0.00%	85.00%	13,500	0.00%	0.10%	0.075	0.012	0.105	0.0	0.034	0.025
Geothermal Binary 30 MW	30	8.50%	0.50%	2.74%	2.00%	2.20%	95.00%	34,120	0.00%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Geothermal Flash 30 MW	30	14.00%	0.50%	2.74%	2.00%	2.20%	95.00%	34,120	0.00%	0.00%	0.191	0.011	0.058	98.9	0.026	0.000
Solar Parabolic Trough W/O Storage 250 MW	250	9.00%	0.50%	2.74%	0.00%	1.00%	29.00%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Parabolic Trough With Storage 250 MW	250	9.00%	0.50%	2.74%	0.00%	1.00%	45.00%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Power TowerW/O Storage 100 MW	100	7.00%	0.50%	2.74%	0.00%	1.00%	32.00%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Power Tower With Storage 100 MW 6 HRs	100	10.00%	0.50%	2.74%	0.00%	1.00%	48.20%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Power Tower With Storage 100 MW 11 HRs	100	10.00%	0.50%	2.74%	0.00%	1.00%	62.00%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Thin Film) 100 MW	100	11.00%	0.50%	2.74%	0.50%	0.00%	25.30%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Single Axis) 100 MW	100	11.00%	0.50%	2.74%	0.50%	0.00%	31.50%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Thin Film) 20 MW	20	11.00%	0.50%	2.74%	0.50%	0.00%	25.30%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Single Axis) 20 MW	20	11.00%	0.50%	2.74%	0.50%	0.00%	31.50%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Wind - Class 3 100 MW	100	14.00%		2.74%	0.00%	1.00%	43.00%		0.00%		0.000	0.000	0.000	0.0	0.000	0.000
Wind - Class 4 100 MW	100	14.00%		2.74%	0.00%	1.00%	45.00%		0.00%		0.000	0.000	0.000	0.0	0.000	0.000

Plant Costs and Plant Parameters
Mid-Cost Case; Start-Year = 2022

Technology - Plant Costs Start Year = 2022 (2022 Dollars)	Gross Capacity (MW)	Instant Costs ($/kW)	Installed Costs ($/kW)			Construction Period (%/Year)						Fixed O&M ($/kW-Yr)	Variable O&M ($/MWh)
			Merchant	IOU	POU	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5		
Generation Turbine 49.9 MW	49.9	2,106	2,355	2,376	2,343	100%	0%	0%	0%	0%	0%	34.50	0.00
Generation Turbine 100 MW	100	2,061	2,305	2,325	2,293	100%	0%	0%	0%	0%	0%	33.35	0.00
Generation Turbine - Advanced 200 MW	200	1,442	1,632	1,658	1,618	75%	25%	0%	0%	0%	0%	30.67	0.00
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	1,635	1,859	1,893	1,838	75%	25%	0%	0%	0%	0%	42.01	0.75
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	1,661	1,889	1,923	1,868	75%	25%	0%	0%	0%	0%	42.01	0.75
Biomass Fludized Bed Boiler 50 MW	50	6,136	7,200	7,248	6,959	50%	40%	10%	0%	0%	0%	129.14	6.43
Geothermal Binary 30 MW	30	6,074	8,071	8,218	7,374	20%	20%	18%	16%	5%	20%	109.14	0.00
Geothermal Flash 30 MW	30	6,978	8,948	9,082	8,305	24%	24%	24%	13%	2%	13%	109.14	0.00
Solar Parabolic Trough W/O Storage 250 MW	250	3,427	3,995	4,034	3,890	50%	50%	0%	0%	0%	0%	73.37	0.00
Solar Parabolic Trough With Storage 250 MW	250	4,915	5,730	5,786	5,580	50%	50%	0%	0%	0%	0%	73.37	0.00
Solar Power TowerW/O Storage 100 MW	100	3,741	4,361	4,404	4,247	50%	50%	0%	0%	0%	0%	52.63	0.00
Solar Power Tower With Storage 100 MW 6 HRs	100	5,248	6,117	6,177	5,957	50%	50%	0%	0%	0%	0%	68.25	0.00
Solar Power Tower With Storage 100 MW 11 HRs	100	6,038	7,038	7,108	6,854	50%	50%	0%	0%	0%	0%	68.25	0.00
Solar Photovoltaic (Thin Film) 100 MW	100	2,078	2,353	2,364	2,322	100%	0%	0%	0%	0%	0%	34.70	0.00
Solar Photovoltaic (Single Axis) 100 MW	100	1,803	2,041	2,051	2,014	100%	0%	0%	0%	0%	0%	44.98	0.00
Solar Photovoltaic (Thin Film) 20 MW	20	2,893	3,275	3,291	3,231	100%	0%	0%	0%	0%	0%	34.70	0.00
Solar Photovoltaic (Single Axis) 20 MW	20	2,616	2,962	2,976	2,923	100%	0%	0%	0%	0%	0%	44.98	0.00
Wind - Class 3 100 MW	100	2,131	2,470	2,483	2,435	95%	5%	0%	0%	0%	0%	38.55	10.28
Wind - Class 4 100 MW	100	1,844	2,137	2,148	2,107	95%	5%	0%	0%	0%	0%	38.55	10.28

Technology Input Parameters	Gross Capacity (MW)	Plant Side Losses	Transformer Losses	Transmission Losses	Scheduled Outage Factor	Forced Outage Rate	Capacity Factor	HHV Heat Rate (Btu/kWh)	Degradation (%/Year)		Emission Factors (Lbs/MWh)					
									Capacity	Heat Rate	NOx	VOC	CO	CO2	SOx	PM10
Generation Turbine 49.9 MW	50	3.40%	0.50%	1.77%	2.72%	5.56%	7.50%	10,585	0.05%	0.05%	1.274	0.247	1.680	1239.3	0.059	0.612
Generation Turbine 100 MW	100	3.40%	0.50%	1.77%	3.18%	4.13%	7.50%	10,585	0.05%	0.05%	1.274	0.247	1.680	1239.3	0.059	0.612
Generation Turbine - Advanced 200 MW	200	3.40%	0.50%	1.77%	3.18%	4.13%	11.25%	9,880	0.05%	0.05%	0.301	0.094	0.578	1156.8	0.024	0.189
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	2.90%	0.50%	1.77%	6.02%	2.24%	57.00%	7,250	0.24%	0.24%	0.111	0.038	0.328	848.8	0.008	0.058
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	2.90%	0.50%	1.77%	6.02%	2.24%	57.00%	7,250	0.24%	0.24%	0.120	0.028	0.497	848.8	0.014	0.066
Biomass Fludized Bed Boiler 50 MW	50	4.00%	0.50%	2.74%	7.60%	9.00%	80.70%	14,500	0.10%	0.15%	0.075	0.012	0.105	195.0	0.034	0.100
Geothermal Binary 30 MW	30	11.50%	0.50%	2.74%	4.00%	2.50%	85.00%	34,377	0.50%	3.00%	0.000	0.000	0.000	0.0	0.000	0.000
Geothermal Flash 30 MW	30	17.00%	0.50%	2.74%	4.00%	2.50%	85.00%	34,377	0.50%	3.00%	0.191	0.011	0.058	264.5	0.026	0.000
Solar Parabolic Trough W/O Storage 250 MW	250	10.71%	0.50%	2.74%	2.00%	6.00%	26.50%		0.50%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Parabolic Trough With Storage 250 MW	250	10.71%	0.50%	2.74%	2.00%	6.00%	43.00%		0.50%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Power TowerW/O Storage 100 MW	100	12.00%	0.50%	2.74%	2.00%	6.00%	31.00%		0.50%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Power Tower With Storage 100 MW 6 HRs	100	12.00%	0.50%	2.74%	2.00%	6.00%	40.00%		0.50%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Power Tower With Storage 100 MW 11 HRs	100	12.50%	0.50%	2.74%	2.00%	6.00%	56.00%		0.50%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Thin Film) 100 MW	100	13.50%	0.50%	2.74%	1.50%	0.00%	21.70%		0.95%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Single Axis) 100 MW	100	13.50%	0.50%	2.74%	1.50%	0.00%	26.60%		0.55%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Thin Film) 20 MW	20	13.50%	0.50%	2.74%	1.50%	0.00%	21.70%		0.95%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Single Axis) 20 MW	20	13.50%	0.50%	2.74%	1.50%	0.00%	26.60%		0.55%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Wind - Class 3 100 MW	100	15.00%	0.50%	2.74%	0.00%	1.00%	42.00%		0.30%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Wind - Class 4 100 MW	100	15.00%	0.50%	2.74%	0.00%	1.00%	39.00%		0.30%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000

Plant Costs and Plant Parameters High-Cost Case; Start-Year = 2022

Technology - Plant Costs Start Year = 2022 (2022 Dollars)	Gross Capacity (MW)	Instant Costs ($/kW)	Installed Costs ($/kW)			Construction Period (%/Year)						Fixed O&M ($/kW-Yr)	Variable O&M ($/MWh)
			Merchant	IOU	POU	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5		
Generation Turbine 49.9 MW	49.9	2,855	3,345	3,379	3,330	75%	25%	0%	0%	0%	0%	91.35	0.00
Generation Turbine 100 MW	100	2,727	3,194	3,227	3,180	75%	25%	0%	0%	0%	0%	89.40	0.00
Generation Turbine - Advanced 200 MW	200	2,068	2,469	2,505	2,453	50%	40%	10%	0%	0%	0%	84.95	0.00
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	1,849	2,229	2,266	2,211	50%	40%	10%	0%	0%	0%	100.18	2.30
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	1,882	2,269	2,307	2,251	50%	40%	10%	0%	0%	0%	100.18	2.30
Biomass Fludized Bed Boiler 50 MW	50	8,094	10,127	10,211	9,877	33%	33%	33%	0%	0%	0%	122.08	19.28
Geothermal Binary 30 MW	30	7,620	11,154	11,381	10,530	13%	18%	18%	15%	14%	22%	188.13	0.00
Geothermal Flash 30 MW	30	9,235	13,036	13,264	12,399	13%	21%	21%	21%	11%	13%	221.91	0.00
Solar Parabolic Trough W/O Storage 250 MW	250	5,092	6,253	6,318	6,147	40%	40%	20%	0%	0%	0%	119.51	12.85
Solar Parabolic Trough With Storage 250 MW	250	8,492	10,427	10,535	10,250	40%	40%	20%	0%	0%	0%	179.90	12.85
Solar Power TowerW/O Storage 100 MW	100	5,688	6,985	7,057	6,867	40%	40%	20%	0%	0%	0%	111.80	0.00
Solar Power Tower With Storage 100 MW 6 HRs	100	7,541	9,260	9,356	9,103	40%	40%	20%	0%	0%	0%	179.90	12.85
Solar Power Tower With Storage 100 MW 11 HRs	100	7,878	9,674	9,775	9,510	40%	40%	20%	0%	0%	0%	179.90	12.85
Solar Photovoltaic (Thin Film) 100 MW	100	2,883	3,506	3,535	3,458	50%	50%	0%	0%	0%	0%	64.25	0.00
Solar Photovoltaic (Single Axis) 100 MW	100	3,576	4,348	4,384	4,289	50%	50%	0%	0%	0%	0%	64.25	0.00
Solar Photovoltaic (Thin Film) 20 MW	20	4,426	5,382	5,427	5,310	50%	50%	0%	0%	0%	0%	64.25	0.00
Solar Photovoltaic (Single Axis) 20 MW	20	5,493	6,679	6,734	6,589	50%	50%	0%	0%	0%	0%	64.25	0.00
Wind - Class 3 100 MW	100	2,912	3,621	3,655	3,564	45%	45%	10%	0%	0%	0%	38.55	12.85
Wind - Class 4 100 MW	100	2,435	3,027	3,056	2,980	45%	45%	10%	0%	0%	0%	38.55	12.85

Technology Input Parameters	Gross Capacity (MW)	Plant Side Losses	Transformer Losses	Transmission Losses	Scheduled Outage Factor	Forced Outage Rate	Capacity Factor	HHV Heat Rate (Btu/kWh)	Degradation (%/Year)		Emission Factors (Lbs/MWh)					
									Capacity	Heat Rate	NOx	VOC	CO	CO2	SOx	PM10
Generation Turbine 49.9 MW	50	4.20%	0.50%	1.77%	2.72%	5.56%	4.00%	11,890	0.05%	0.20%	2.389	0.462	3.151	1392.1	0.111	1.147
Generation Turbine 100 MW	100	4.20%	0.50%	1.77%	3.18%	4.13%	4.00%	11,890	0.05%	0.20%	2.389	0.462	3.151	1392.1	0.111	1.147
Generation Turbine - Advanced 200 MW	200	4.20%	0.50%	1.77%	3.18%	4.13%	6.00%	10,200	0.05%	0.20%	0.565	0.177	1.084	1194.2	0.046	0.354
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	4.00%	0.50%	1.77%	6.02%	2.24%	40.00%	7,480	0.24%	0.20%	0.158	0.054	0.468	875.8	0.011	0.083
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	4.00%	0.50%	1.77%	6.02%	2.24%	40.00%	7,480	0.24%	0.20%	0.171	0.041	0.709	875.8	0.020	0.095
Biomass Fludized Bed Boiler 50 MW	50	7.00%	0.50%	2.74%	7.60%	9.00%	78.20%	14,500	0.20%	0.20%	0.075	0.012	0.105	40.6	0.034	0.200
Geothermal Binary 30 MW	30	14.50%	0.50%	2.74%	12.00%	2.80%	77.09%	34,633	2.00%	5.00%	0.000	0.000	0.000	180.0	0.000	0.000
Geothermal Flash 30 MW	30	20.00%	0.50%	2.74%	12.00%	2.80%	71.81%	34,633	2.00%	5.00%	0.191	0.011	0.058	397.0	0.026	0.000
Solar Parabolic Trough W/O Storage 250 MW	250	15.00%	0.50%	2.74%	4.00%	8.00%	20.00%		1.40%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Parabolic Trough With Storage 250 MW	250	15.00%	0.50%	2.74%	4.00%	8.00%	41.00%		1.40%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Power TowerW/O Storage 100 MW	100	13.00%	0.50%	2.74%	4.00%	8.00%	30.00%		1.40%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Power Tower With Storage 100 MW 6 HRs	100	13.00%	0.50%	2.74%	4.00%	8.00%	36.00%		1.40%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Power Tower With Storage 100 MW 11 HRs	100	13.00%	0.50%	2.74%	4.00%	8.00%	52.30%		1.40%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Thin Film) 100 MW	100	21.00%	0.50%	2.74%	4.00%	0.00%	18.50%		1.60%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Single Axis) 100 MW	100	21.00%	0.50%	2.74%	4.00%	0.00%	24.00%		1.25%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Thin Film) 20 MW	20	21.00%	0.50%	2.74%	4.00%	0.00%	18.50%		1.60%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Single Axis) 20 MW	20	21.00%	0.50%	2.74%	4.00%	0.00%	24.00%		1.25%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Wind - Class 3 100 MW	100	16.50%		2.74%	0.00%	1.00%	30.00%		0.80%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Wind - Class 4 100 MW	100	16.50%		2.74%	0.00%	1.00%	30.00%		0.80%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000

Plant Costs and Plant Parameters Low-Cost Case; Start-Year = 2022

Technology - Plant Costs Start Year = 2022 (2022 Dollars)	Gross Capacity (MW)	Instant Costs ($/kW)	Installed Costs ($/kW)			Construction Period (%/Year)						Fixed O&M ($/kW-Yr)	Variable O&M ($/MWh)
			Merchant	IOU	POU	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5		
Generation Turbine 49.9 MW	49.9	1,564	1,667	1,672	1,663	100%	0%	0%	0%	0%	0%	12.13	0.00
Generation Turbine 100 MW	100	1,555	1,657	1,662	1,653	100%	0%	0%	0%	0%	0%	11.75	0.00
Generation Turbine - Advanced 200 MW	200	951	1,029	1,036	1,021	100%	0%	0%	0%	0%	0%	10.86	0.00
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	1,401	1,516	1,528	1,503	100%	0%	0%	0%	0%	0%	16.76	0.23
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	1,418	1,535	1,547	1,521	100%	0%	0%	0%	0%	0%	16.76	0.23
Biomass Fludized Bed Boiler 50 MW	50	4,145	4,497	4,524	4,437	80%	20%	0%	0%	0%	0%	129.14	6.43
Geothermal Binary 30 MW	30	5,076	5,868	5,958	5,670	30%	33%	28%	9%	0%	0%	109.14	0.00
Geothermal Flash 30 MW	30	4,489	5,117	5,186	4,964	34%	42%	19%	5%	0%	0%	104.70	0.00
Solar Parabolic Trough W/O Storage 250 MW	250	2,338	2,549	2,576	2,520	67%	33%	0%	0%	0%	0%	57.83	0.00
Solar Parabolic Trough With Storage 250 MW	250	3,931	4,285	4,331	4,236	67%	33%	0%	0%	0%	0%	57.83	0.00
Solar Power TowerW/O Storage 100 MW	100	2,767	3,016	3,049	2,982	67%	33%	0%	0%	0%	0%	83.53	0.00
Solar Power Tower With Storage 100 MW 6 HRs	100	3,934	4,288	4,334	4,239	67%	33%	0%	0%	0%	0%	57.83	0.00
Solar Power Tower With Storage 100 MW 11 HRs	100	4,639	5,056	5,111	4,998	67%	33%	0%	0%	0%	0%	57.83	0.00
Solar Photovoltaic (Thin Film) 100 MW	100	1,146	1,250	1,259	1,240	100%	0%	0%	0%	0%	0%	21.85	0.00
Solar Photovoltaic (Single Axis) 100 MW	100	1,411	1,538	1,549	1,526	100%	0%	0%	0%	0%	0%	25.70	0.00
Solar Photovoltaic (Thin Film) 20 MW	20	1,548	1,687	1,700	1,674	100%	0%	0%	0%	0%	0%	21.85	0.00
Solar Photovoltaic (Single Axis) 20 MW	20	1,952	2,128	2,143	2,112	100%	0%	0%	0%	0%	0%	25.70	0.00
Wind - Class 3 100 MW	100	1,848	2,037	2,052	2,021	100%	0%	0%	0%	0%	0%	38.55	7.71
Wind - Class 4 100 MW	100	1,595	1,758	1,770	1,744	100%	0%	0%	0%	0%	0%	38.55	7.71

Technology Input Parameters	Gross Capacity (MW)	Plant Side Losses	Transformer Losses	Transmission Losses	Scheduled Outage Factor	Forced Outage Rate	Capacity Factor	HHV Heat Rate (Btu/kWh)	Degradation (%/Year)		Emission Factors (Lbs/MWh)					
									Capacity	Heat Rate	NOx	VOC	CO	CO2	SOx	PM10
Generation Turbine 49.9 MW	50	2.30%	0.50%	1.77%	2.72%	5.56%	14.00%	9,980	0.05%	0.05%	0.682	0.132	0.900	1168.5	0.032	0.328
Generation Turbine 100 MW	100	2.30%	0.50%	1.77%	3.18%	4.13%	14.00%	9,980	0.05%	0.05%	0.682	0.132	0.900	1168.5	0.032	0.328
Generation Turbine - Advanced 200 MW	200	2.30%	0.50%	1.77%	3.18%	4.13%	21.00%	9,600	0.05%	0.05%	0.161	0.051	0.310	1124.0	0.013	0.101
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	2.00%	0.50%	1.77%	6.02%	2.24%	71.00%	7,030	0.24%	0.20%	0.089	0.030	0.264	823.1	0.006	0.047
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	2.00%	0.50%	1.77%	6.02%	2.24%	71.00%	7,030	0.24%	0.20%	0.096	0.023	0.399	823.1	0.011	0.053
Biomass Fludized Bed Boiler 50 MW	50	2.00%	0.50%	2.74%	0.00%	0.00%	85.00%	13,500	0.00%	0.10%	0.075	0.012	0.105	0.0	0.034	0.025
Geothermal Binary 30 MW	30	8.50%	0.50%	2.74%	2.00%	2.20%	95.00%	34,120	0.00%	0.00%	0.000	0.000	0.000	0.0	0.000	0.000
Geothermal Flash 30 MW	30	14.00%	0.50%	2.74%	2.00%	2.20%	95.00%	34,120	0.00%	0.00%	0.191	0.011	0.058	98.9	0.026	0.000
Solar Parabolic Trough W/O Storage 250 MW	250	9.00%	0.50%	2.74%	0.00%	1.00%	29.00%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Parabolic Trough With Storage 250 MW	250	9.00%	0.50%	2.74%	0.00%	1.00%	45.00%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Power TowerW/O Storage 100 MW	100	7.00%	0.50%	2.74%	0.00%	1.00%	32.00%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Power Tower With Storage 100 MW 6 HRs	100	10.00%	0.50%	2.74%	0.00%	1.00%	48.20%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Power Tower With Storage 100 MW 11 HRs	100	10.00%	0.50%	2.74%	0.00%	1.00%	62.00%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Thin Film) 100 MW	100	11.00%	0.50%	2.74%	0.50%	0.00%	25.30%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Single Axis) 100 MW	100	11.00%	0.50%	2.74%	0.50%	0.00%	31.50%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Thin Film) 20 MW	20	11.00%	0.50%	2.74%	0.50%	0.00%	25.30%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Solar Photovoltaic (Single Axis) 20 MW	20	11.00%	0.50%	2.74%	0.50%	0.00%	31.50%		0.25%		0.000	0.000	0.000	0.0	0.000	0.000
Wind - Class 3 100 MW	100	14.00%	0.50%	2.74%	0.00%	1.00%	43.00%		0.00%		0.000	0.000	0.000	0.0	0.000	0.000
Wind - Class 4 100 MW	100	14.00%	0.50%	2.74%	0.00%	1.00%	45.00%		0.00%		0.000	0.000	0.000	0.0	0.000	0.000

Nat Gas, Biomass & Carbon Prices

Inflation Rate	Year	Deflator Series	PG&E	SCE	SDG&E	SMUD	LADWP	IID	Mid-range CA Avg.	High CA Average	Low CA Average	Biomass Mid	Biomass High	Biomass Low	No Carbon Price	Carbon Price Mid	Carbon Price High	Carbon Price Low	*Carbon Price Cap*
0.8%	2011	1.000	3.96	4.50	4.60	3.96	4.50	4.50	4.28	6.14	2.79	$2.08	$2.60	$1.56					
1.9%	2012	1.019	5.94	6.48	6.68	5.94	6.48	6.48	6.26	9.07	3.94	$2.12	$2.65	$1.59	$0.00	$13.62	$13.62	$10.00	50
2.7%	2013	2.000	6.76	7.38	7.63	6.76	7.38	7.38	7.14	10.43	4.36	$2.16	$2.70	$1.62	$0.00	$13.62	$32.13	$10.71	50
2.2%	2014	2.045	5.74	6.41	6.59	5.74	6.41	6.41	6.14	9.04	3.66	$2.20	$2.75	$1.65	$0.00	$17.25	$34.49	$11.50	53.674
2.0%	2015	3.000	5.85	6.52	6.71	5.85	6.52	6.52	6.26	9.28	3.65	$2.24	$2.80	$1.68	$0.00	$18.46	$36.92	$12.31	57.458
1.9%	2016	3.057	6.35	7.03	7.25	6.35	7.03	7.03	6.76	10.09	3.88	$2.28	$2.85	$1.71	$0.00	$19.75	$39.51	$13.17	61.479
1.7%	2017	4.000	6.41	7.10	7.32	6.41	7.10	7.10	6.85	10.28	3.87	$2.33	$2.91	$1.74	$0.00	$21.09	$42.18	$14.06	65.647
1.5%	2018	4.061	6.85	7.55	7.79	6.85	7.55	7.55	7.30	11.01	4.06	$2.37	$2.96	$1.78	$0.00	$22.49	$44.97	$14.99	69.985
1.5%	2019	5.000	6.58	7.31	7.53	6.58	7.31	7.31	7.04	10.68	3.86	$2.41	$3.02	$1.81	$0.00	$23.96	$47.92	$15.97	74.565
1.4%	2020	5.072	7.05	7.79	8.03	7.05	7.79	7.79	7.52	11.45	4.08	$2.46	$3.08	$1.85	$0.00	$25.52	$51.04	$17.01	79.42
1.5%	2021	6.000	7.14	7.89	8.13	7.14	7.89	7.89	7.61	11.65	4.08	$2.51	$3.13	$1.88	$0.00	$27.18	$54.37	$18.12	84.603
1.5%	2022	6.088	7.46	8.22	8.48	7.46	8.22	8.22	7.94	12.20	4.22	$2.55	$3.19	$1.92	$0.00	$28.96	$57.92	$19.31	90.136
1.5%	2023	7.000	7.90	8.68	8.96	7.90	8.68	8.68	8.39	12.94	4.41	$2.60	$3.25	$1.95	$0.00	$30.87	$61.74	$20.58	96.072
1.5%	2024	7.106	7.64	8.45	8.71	7.64	8.45	8.45	8.15	12.62	4.25	$2.65	$3.32	$1.99	$0.00	$32.90	$65.80	$21.93	102.4
1.5%	2025	8.000	8.04	8.87	9.15	8.04	8.87	8.87	8.57	13.30	4.43	$2.70	$3.38	$2.03	$0.00	$35.07	$70.14	$23.38	109.14
1.5%	2026	8.121	8.07	8.95	9.24	8.07	8.95	8.95	8.63	13.44	4.43	$2.75	$3.44	$2.07	$0.00	$37.38	$74.75	$24.92	116.33
1.5%	2027	9.000	8.27	9.19	9.49	8.27	9.19	9.19	8.85	13.83	4.50	$2.81	$3.51	$2.11	$0.00	$39.84	$79.68	$26.56	123.99
1.5%	2028	9.136	8.37	9.34	9.64	8.37	9.34	9.34	8.99	14.08	4.54	$2.86	$3.58	$2.15	$0.00	$42.46	$84.92	$28.31	132.16
1.5%	2029	10.000	8.59	9.60	9.91	8.59	9.60	9.60	9.23	14.50	4.63	$2.91	$3.64	$2.19	$0.00	$45.26	$90.52	$30.17	140.86
1.5%	2030	10.151	8.81	9.87	10.19	8.81	9.87	9.87	9.49	14.94	4.73	$2.97	$3.71	$2.23	$0.00	$48.24	$96.48	$32.16	150.14
1.5%	2031	11.000	8.95	10.05	10.38	8.95	10.05	10.05	9.65	15.25	4.77	$3.03	$3.78	$2.27	$0.00	$51.42	$102.83	$34.28	160.02
1.5%	2032	11.166	9.25	10.37	10.71	9.25	10.37	10.37	9.96	15.79	4.89	$3.08	$3.86	$2.31	$0.00	$54.80	$109.60	$36.53	170.56
1.5%	2033	12.000	9.49	10.63	10.98	9.49	10.63	10.63	10.21	16.25	4.97	$3.14	$3.93	$2.36	$0.00	$58.41	$116.82	$38.94	181.79
1.5%	2034	12.181	9.39	10.54	10.88	9.39	10.54	10.54	10.12	16.14	4.89	$3.20	$4.00	$2.40	$0.00	$62.26	$124.51	$41.50	193.77
1.5%	2035	13.000	9.55	10.70	11.04	9.55	10.70	10.70	10.28	16.45	4.93	$3.26	$4.08	$2.45	$0.00	$66.36	$132.71	$44.24	206.53
1.5%	2036	13.196	10.18	11.33	11.70	10.18	11.33	11.33	10.91	17.52	5.19	$3.33	$4.16	$2.49	$0.00	$70.73	$141.45	$47.15	220.13
1.5%	2037	14.000	10.54	11.70	12.10	10.54	11.70	11.70	11.28	18.16	5.33	$3.39	$4.24	$2.54	$0.00	$75.38	$150.77	$50.26	234.62
1.5%	2038	14.211	10.69	11.86	12.27	10.69	11.86	11.86	11.44	18.47	5.36	$3.45	$4.32	$2.59	$0.00	$80.35	$160.70	$53.57	250.08
1.5%	2039	15.000	11.27	12.45	12.88	11.27	12.45	12.45	12.02	19.48	5.59	$3.52	$4.40	$2.64	$0.00	$85.64	$171.28	$57.09	266.54
1.5%	2040	15.227	10.19	11.36	11.74	10.19	11.36	11.36	10.93	17.77	5.05	$3.59	$4.48	$2.69	$0.00	$91.28	$182.56	$60.85	284.1
1.5%	2041	16.000	10.68	11.85	12.26	10.68	11.85	11.85	11.43	18.63	5.24	$3.65	$4.57	$2.74	$0.00	$97.29	$194.58	$64.86	302.81
1.5%	2042	16.242	11.19	12.36	12.79	11.19	12.36	12.36	11.93	19.51	5.43	$3.72	$4.65	$2.79	$0.00	$103.70	$207.40	$69.13	322.75
1.5%	2043	17.000	11.70	12.87	13.33	11.70	12.87	12.87	12.45	20.42	5.62	$3.79	$4.74	$2.85	$0.00	$110.53	$221.06	$73.69	344
1.5%	2044	17.257	12.24	13.40	13.89	12.24	13.40	13.40	12.98	21.36	5.82	$3.87	$4.83	$2.90	$0.00	$117.81	$235.61	$78.54	366.66
1.5%	2045	18.000	12.78	13.94	14.47	12.78	13.94	13.94	13.53	22.33	6.02	$3.94	$4.92	$2.95	$0.00	$125.56	$251.13	$83.71	390.8
1.5%	2046	18.272	13.17	14.32	14.87	13.17	14.32	14.32	13.91	23.04	6.14	$4.01	$5.02	$3.01	$0.00	$133.83	$267.67	$89.22	416.54

Financial Assumptions

Mid-Cost Case				
	Equity Share	Cost of Equity	Cost of Debt	WACC
Merchant Fossil	33.00%	13.25%	4.52%	6.17%
Merchant Alternative	40.00%	Var*	Var*	Var*
IOU Fossil	55.0%	10.04%	5.28%	6.93%
POU Fossil	N/A	N/A	3.20%	3.20%
High-Cost Case				
	Equity Share	Cost of Equity	Cost of Debt	WACC
Merchant Fossil	60.00%	15.00%	6.63%	10.57%
Merchant Alternative	50.00%	Var*	Var*	Var*
IOU Fossil	70.00%	10.31%	5.65%	8.22%
POU Alternative	N/A	N/A	5.96%	5.96%
Low-Cost Case				
	Equity Share	Cost of Equity	Cost of Debt	WACC
Merchant Fossil	20.00%	10.41%	4.64%	4.28%
Merchant Alternative	Var	Var*	Var*	Var*
IOU Fossil	9.71%	9.71%	4.55%	6.06%
POU Alternative	N/A	N/A	3.02%	3.02%

Var = Variable – Values are variable – see next table

Equity Assumptions

Mid-Cost Case									
Technology	Equity Share			Cost of Equity			Debt		WACC
	Developer's Share	Investor's Share	Total Equity	Developer's Cost	Equity Investor's Cost	Weighted Cost of Equity	Percent Debt	Cost of Debt	
Biomass & Geothermal	33.60%	6.40%	40.00%	13.25%	8.00%	12.41%	60.00%	6.31%	7.21%
Solar Technologies	33.60%	6.40%	40.00%	13.25%	8.00%	12.41%	60.00%	5.91%	7.07%
Wind Technologies	25.47%	14.53%	40.00%	13.25%	8.00%	11.34%	60.00%	5.91%	6.64%

High-Cost Case									
Technology	Equity Share			Cost of Equity			Debt		WACC
	Developer's Share	Investor's Share	Total Equity	Developer's Cost	Equity Investor's Cost	Weighted Cost of Equity	Percent Debt	Cost of Debt	
Biomass & Geothermal	42.00%	8.00%	50.00%	15.00%	10.00%	14.20%	50.00%	7.63%	9.36%
Solar Technologies	42.00%	8.00%	50.00%	15.00%	10.00%	14.20%	50.00%	7.36%	9.28%
Wind Technologies	42.00%	8.00%	50.00%	15.00%	10.00%	14.20%	50.00%	7.36%	9.28%

Low-Cost Case									
Technology	Equity Share			Cost of Equity			Debt		WACC
	Developer's Share	Investor's Share	Total Equity	Developer's Cost	Equity Investor's Cost	Weighted Cost of Equity	Percent Debt	Cost of Debt	
Biomass & Geothermal	15.92%	9.08%	25.00%	10.41%	7.00%	9.17%	75.00%	5.12%	4.57%
Solar Technologies	12.60%	2.40%	15.00%	10.41%	7.00%	9.86%	85.00%	4.59%	3.79%
Wind Technologies	9.55%	5.45%	15.00%	10.41%	7.00%	9.17%	85.00%	4.59%	3.69%

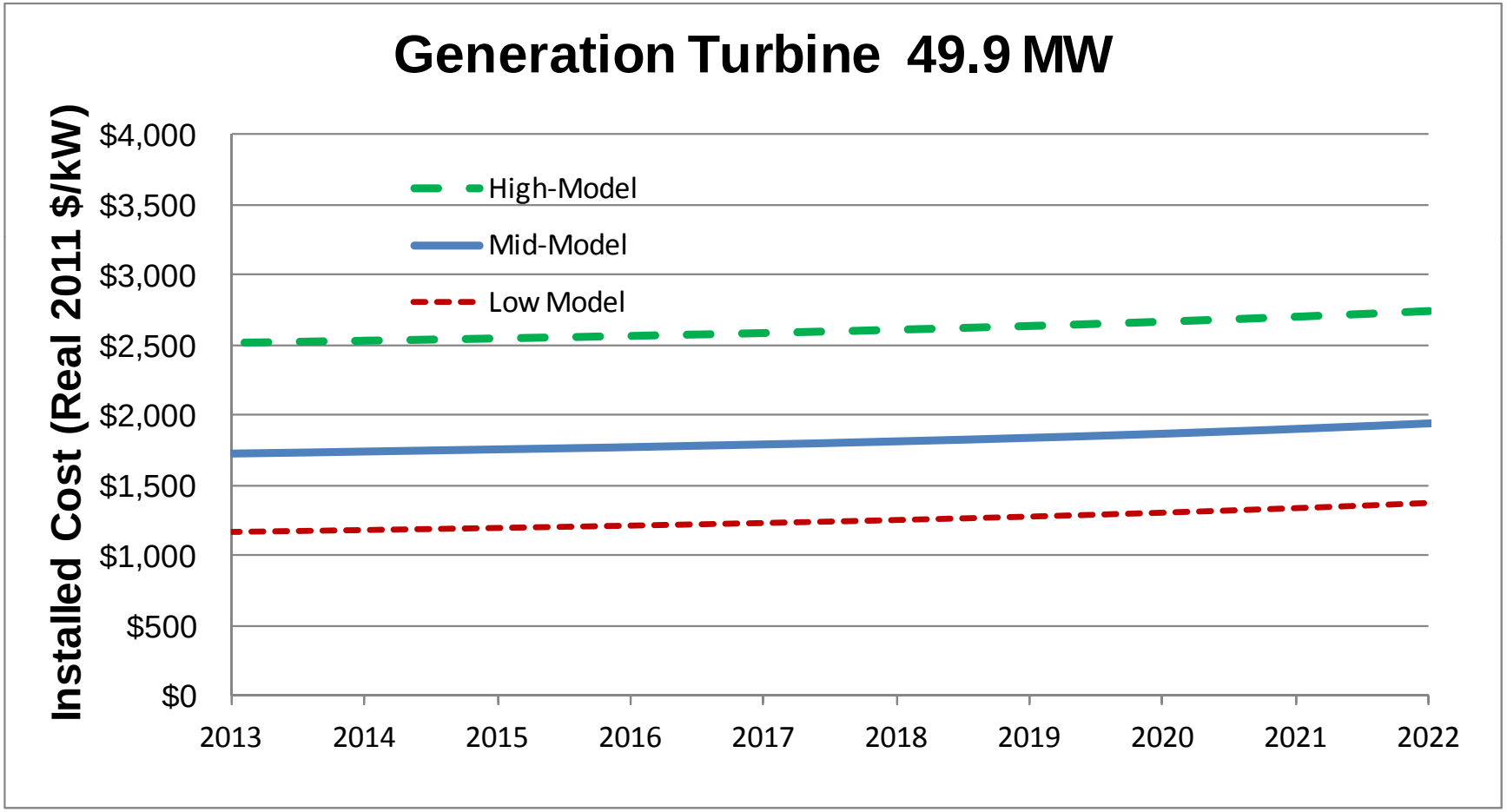
Life and Term Assumptions

Technology	Debt Term (Years)			Book Life (Years)			Equipment Life (Years)			Federal Depreciation			State Depreciation (Years)		
	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low
Generation Turbine 49.9 MW	10	7	20	30	20	30	30	20	30	15	20	20	15	20	20
Generation Turbine 100 MW	10	7	20	30	20	30	30	20	30	15	20	20	15	20	20
Generation Turbine - Advanced 200 MW	10	7	20	30	20	30	30	20	30	15	20	20	15	20	20
Combined Cycle - 2 CTs No Duct Firing 500 MW	10	7	20	30	20	30	30	20	30	20	20	20	20	20	20
Combined Cycle - 2 CTs With Duct Firing 550 MW	10	7	20	30	20	30	30	20	30	20	20	20	20	20	20
Biomass Fludized Bed Boiler 50 MW	20	15	25	30	20	30	20	20	20	5	5	5	20	20	20
Geothermal Binary 30 MW	20	15	25	30	20	30	30	30	30	5	5	5	20	20	20
Geothermal Flash 30 MW	20	15	25	30	20	30	30	30	30	5	5	5	20	20	20
Solar Parabolic Trough W/O Storage 250 MW	20	15	25	30	20	30	20	20	20	5	5	5	20	20	20
Solar Parabolic Trough With Storage 250 MW	20	15	25	30	20	30	20	20	20	5	5	5	20	20	20
Solar Power TowerW/O Storage 100 MW	20	15	25	30	20	30	20	20	20	5	5	5	20	20	20
Solar Power Tower With Storage 100 MW 6 HRs	20	15	25	30	20	30	20	20	20	5	5	5	20	20	20
Solar Power Tower With Storage 100 MW 11 HRs	20	15	25	30	20	30	20	20	20	5	5	5	20	20	20
Solar Photovoltaic (Thin Film) 100 MW	20	15	25	30	20	30	20	20	20	5	5	5	20	20	20
Solar Photovoltaic (Single Axis) 100 MW	20	15	25	30	20	30	20	20	20	5	5	5	20	20	20
Solar Photovoltaic (Thin Film) 20 MW	20	15	25	30	20	30	20	20	20	5	5	5	20	20	20
Solar Photovoltaic (Single Axis) 20 MW	20	15	25	30	20	30	20	20	20	5	5	5	20	20	20
Wind - Class 3 100 MW	20	15	25	30	20	30	30	30	30	5	5	5	30	30	30
Wind - Class 4 100 MW	20	15	25	30	20	30	30	30	30	5	5	5	30	30	30

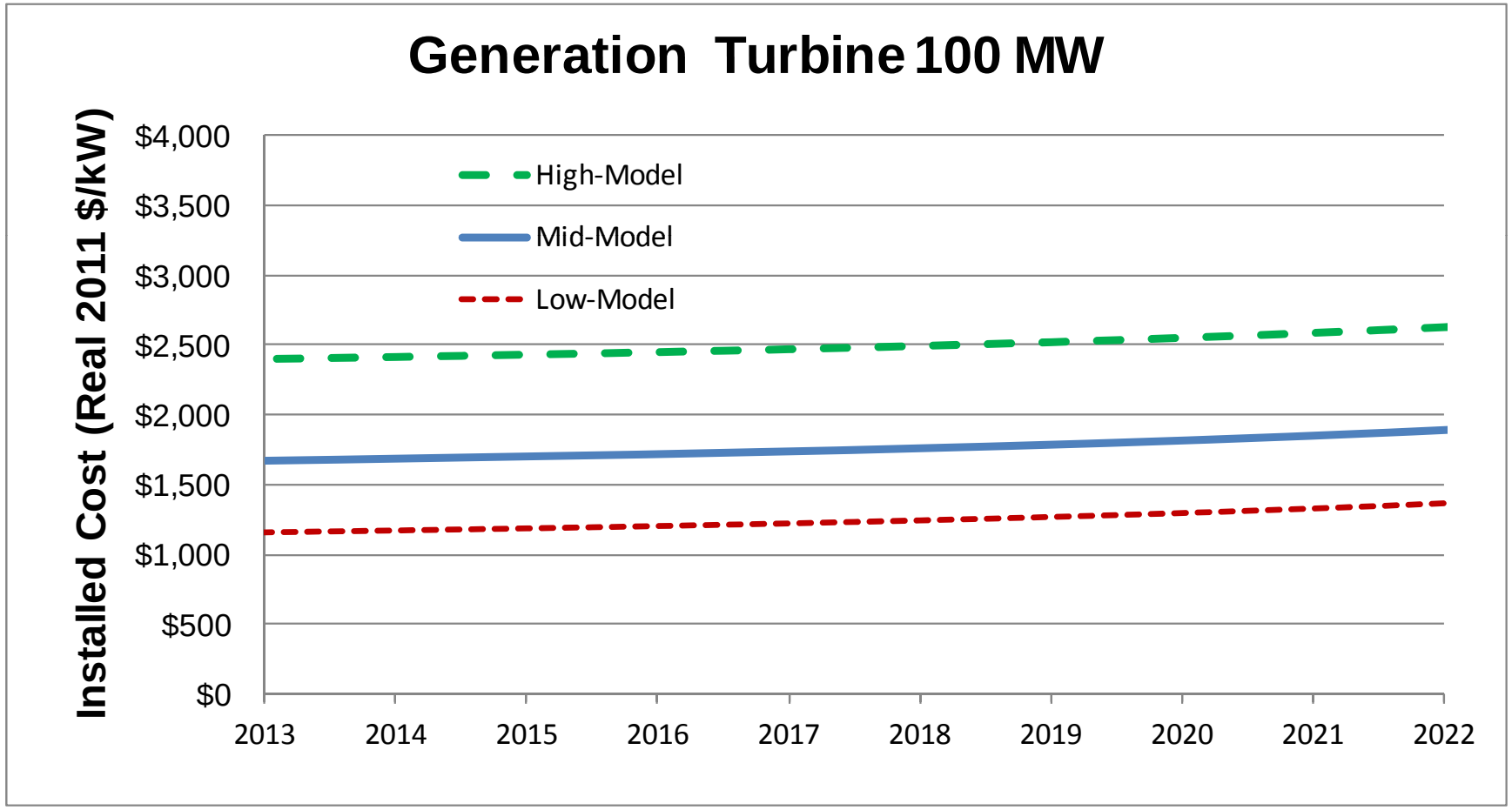
Cost Changes

- Plant Characteristics are constant through the years.
- Instant & Installed Costs increase only with standard inflation, with the exception of ERCs. Costs reflect California average ERCs, which are inflated by the high SC AQMD costs.
- Fixed & Variable O&M increase with normal inflation plus 0.5% real inflations.

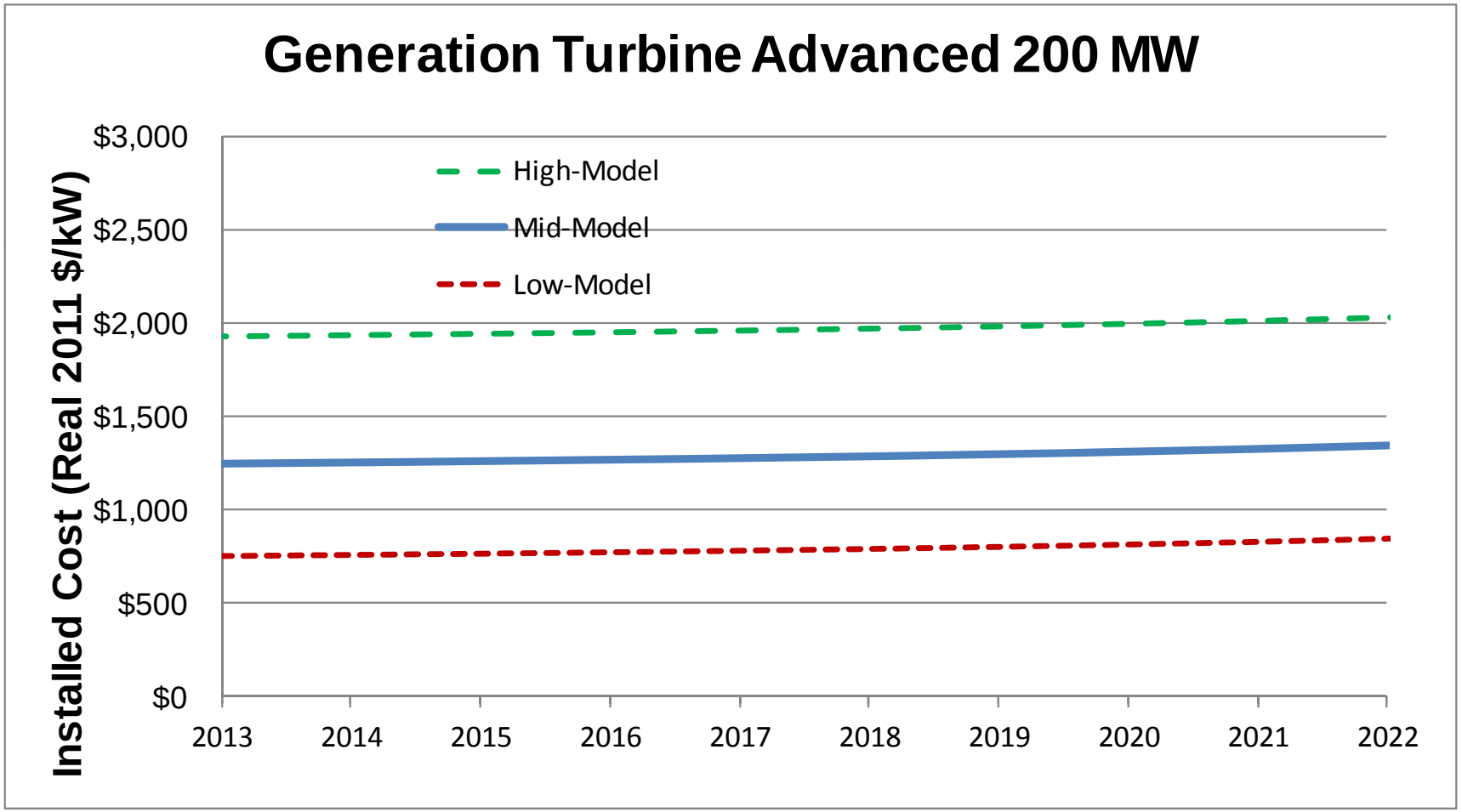
Merchant Installed Costs 2012 -2022



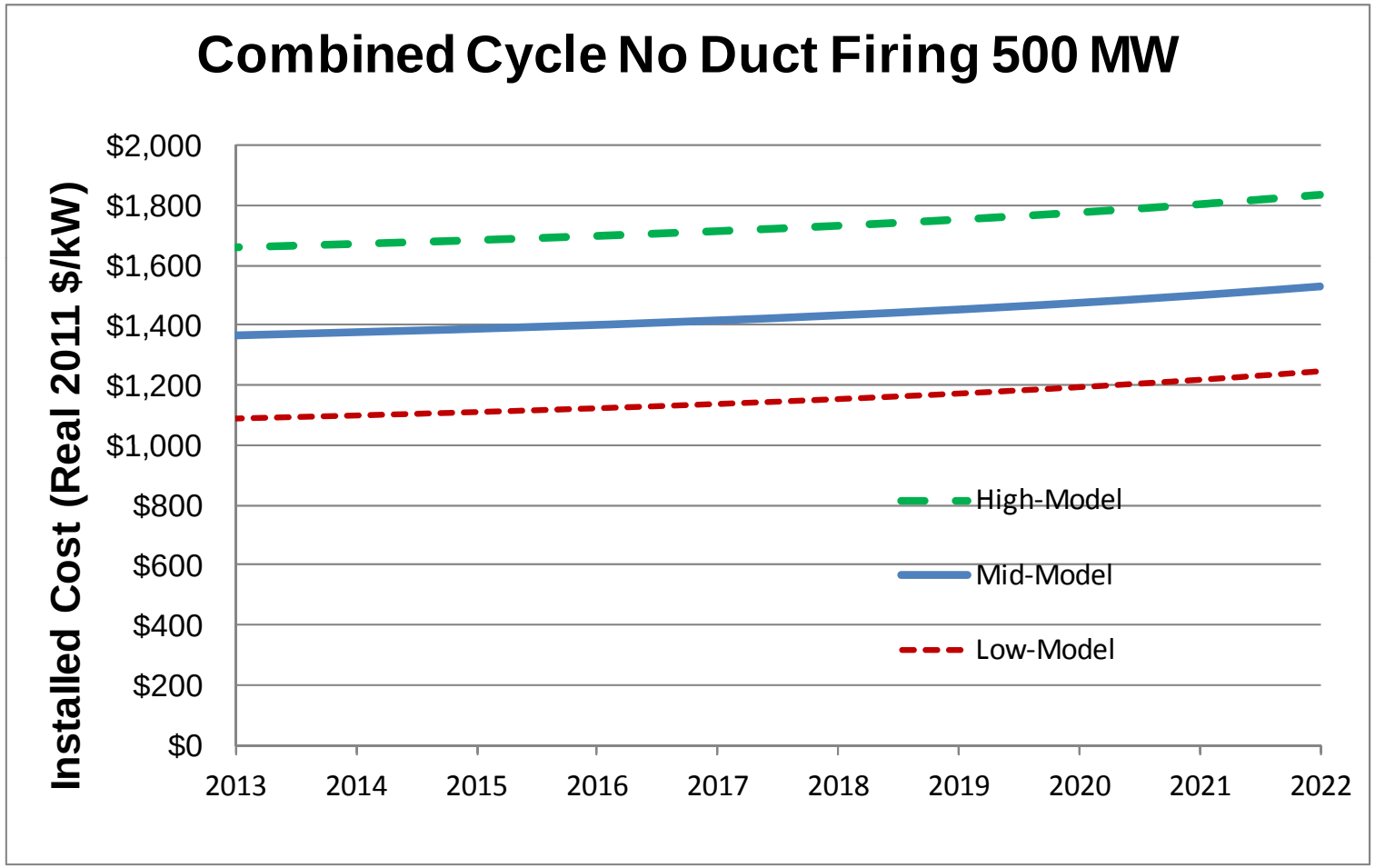
Merchant Installed Costs 2012 -2022



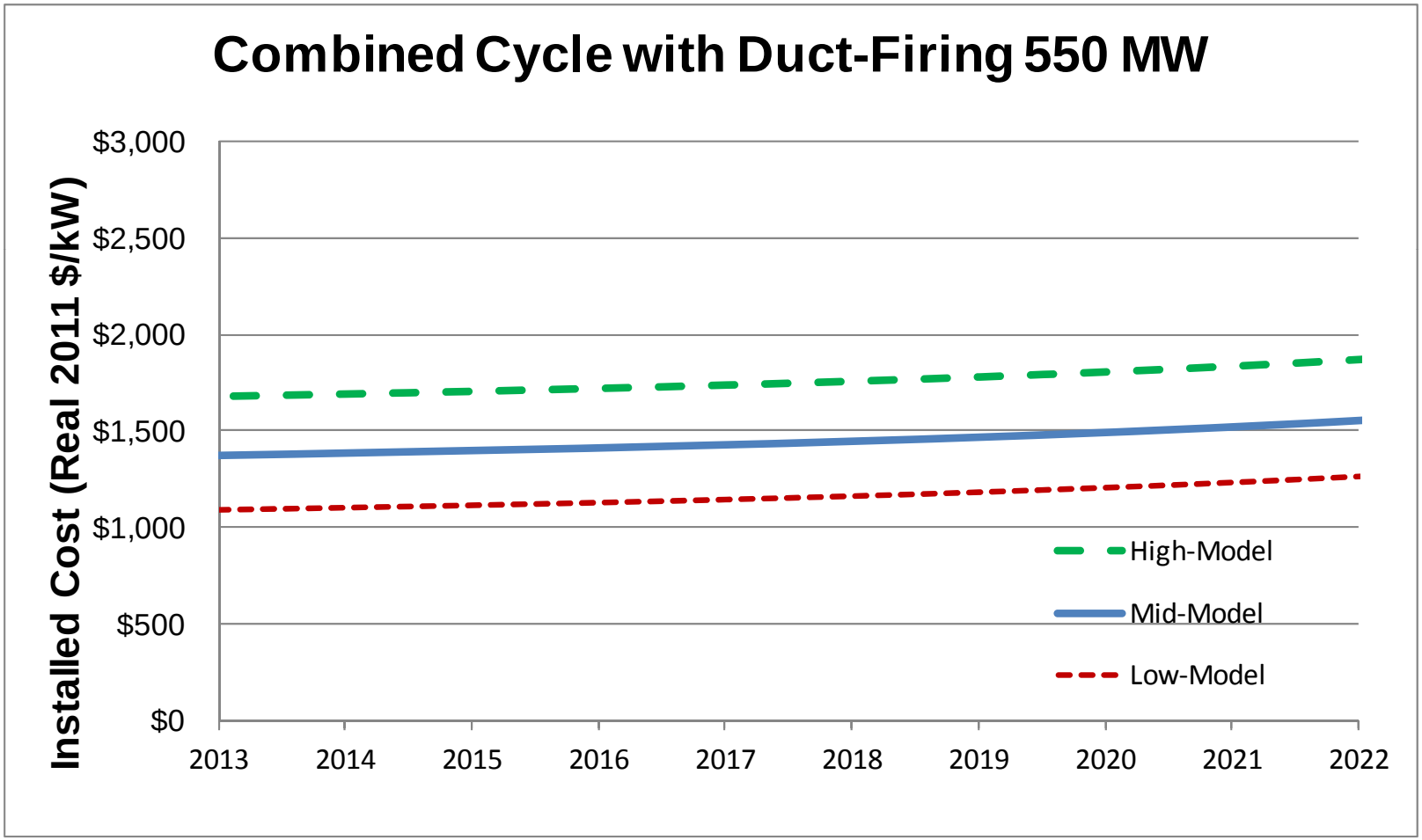
Merchant Installed Costs 2012 -2022



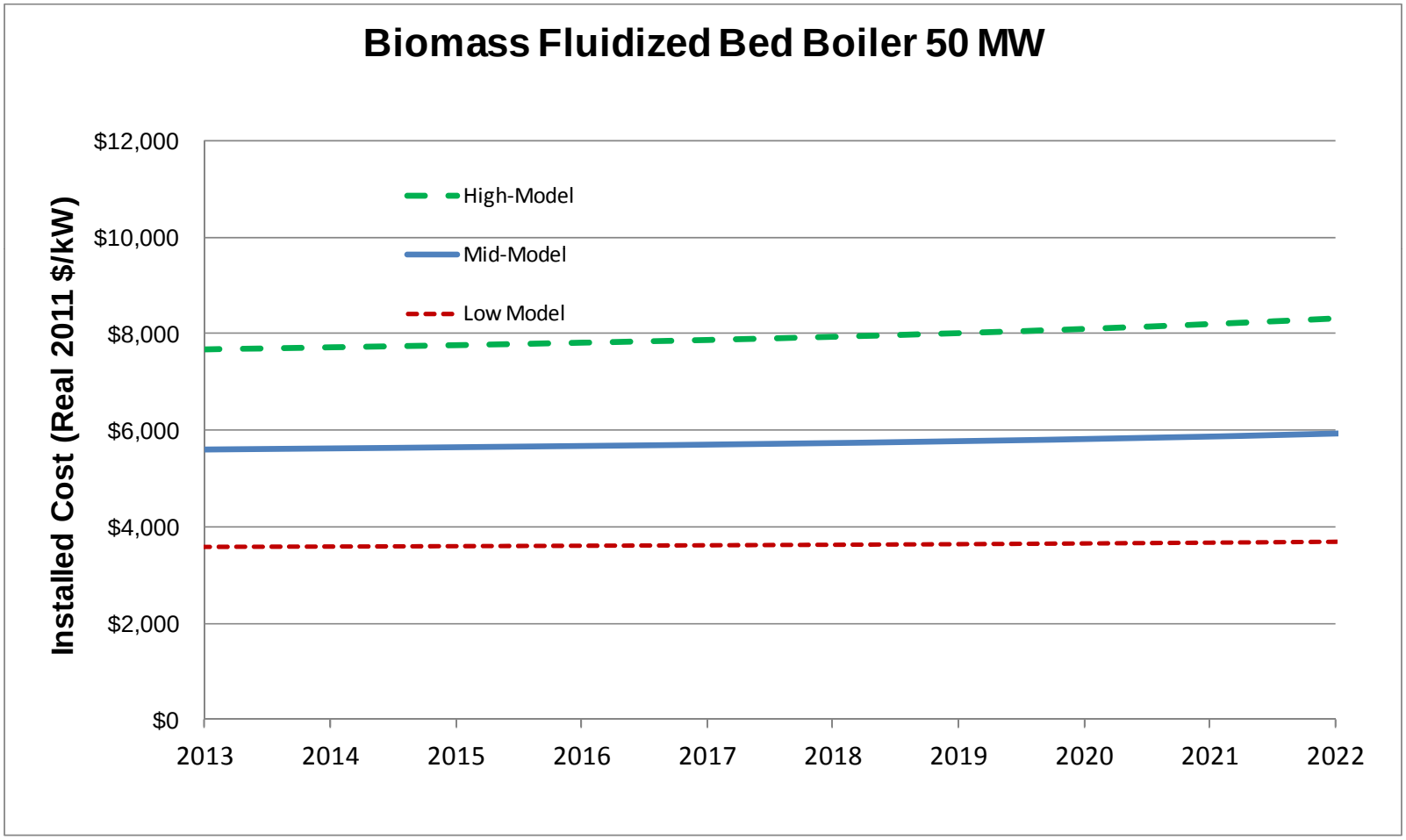
Merchant Installed Costs 2012 -2022



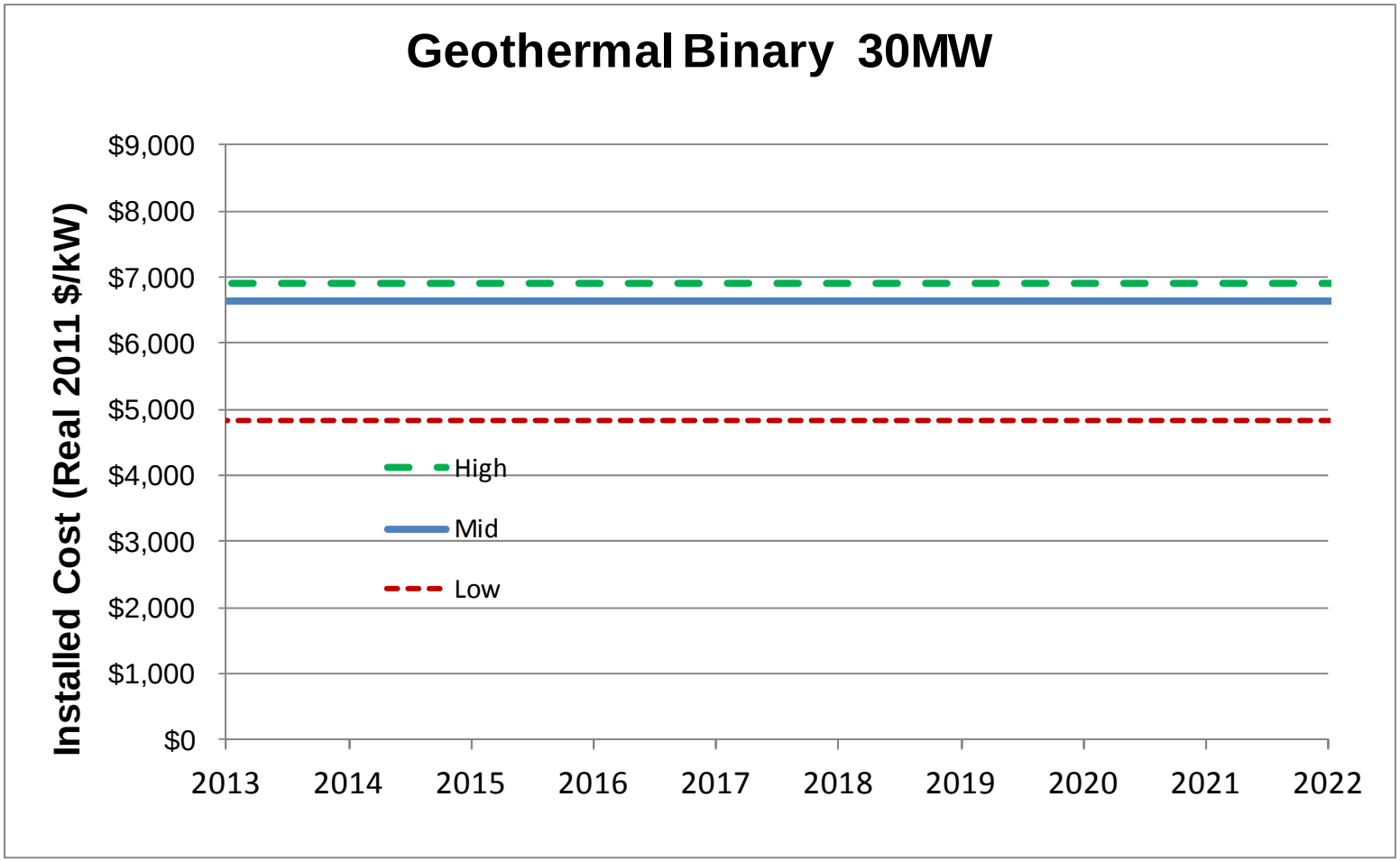
Merchant Installed Costs 2012 -2022



Merchant Installed Costs 2012 -2022



Merchant Installed Costs 2012 -2022



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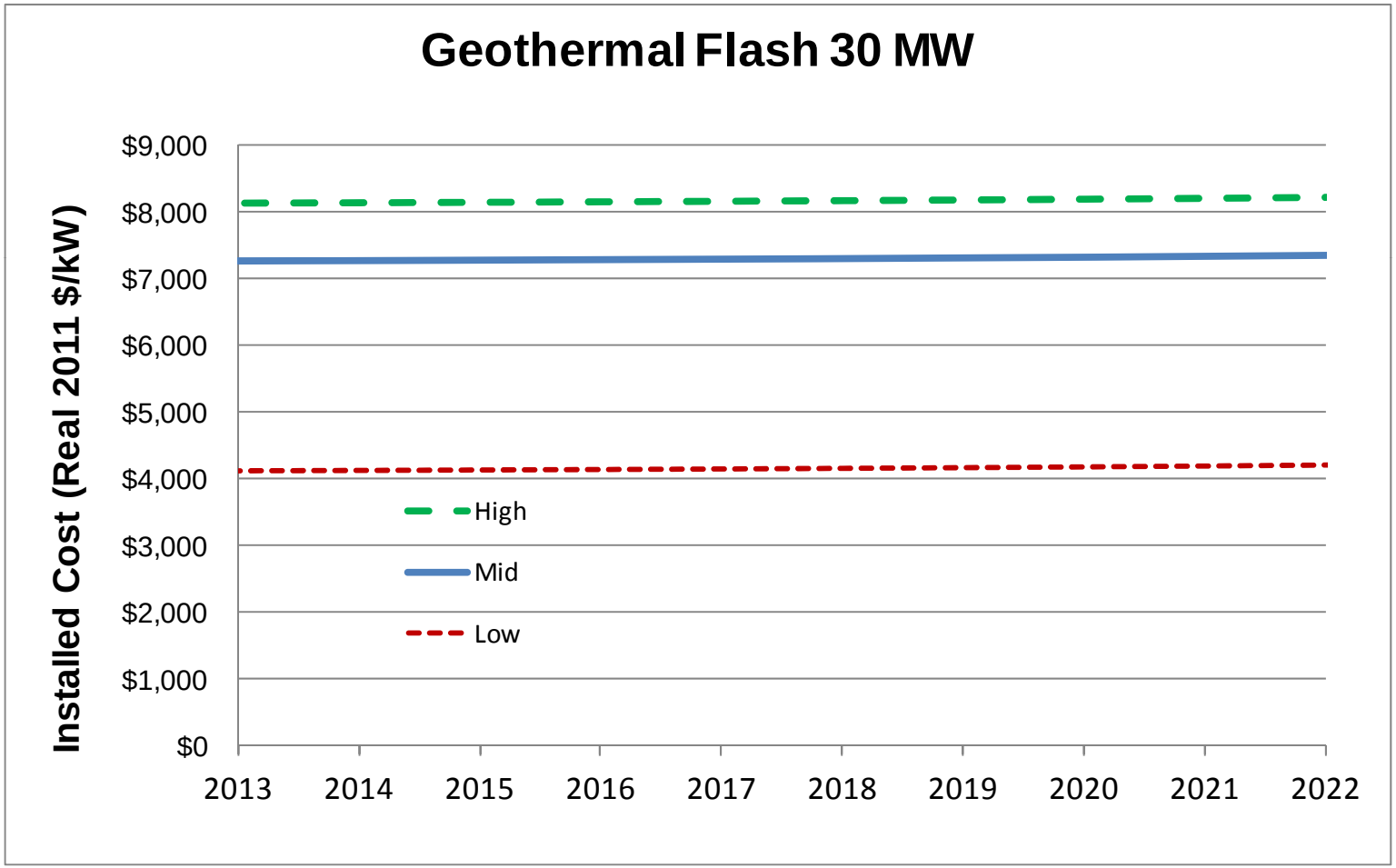

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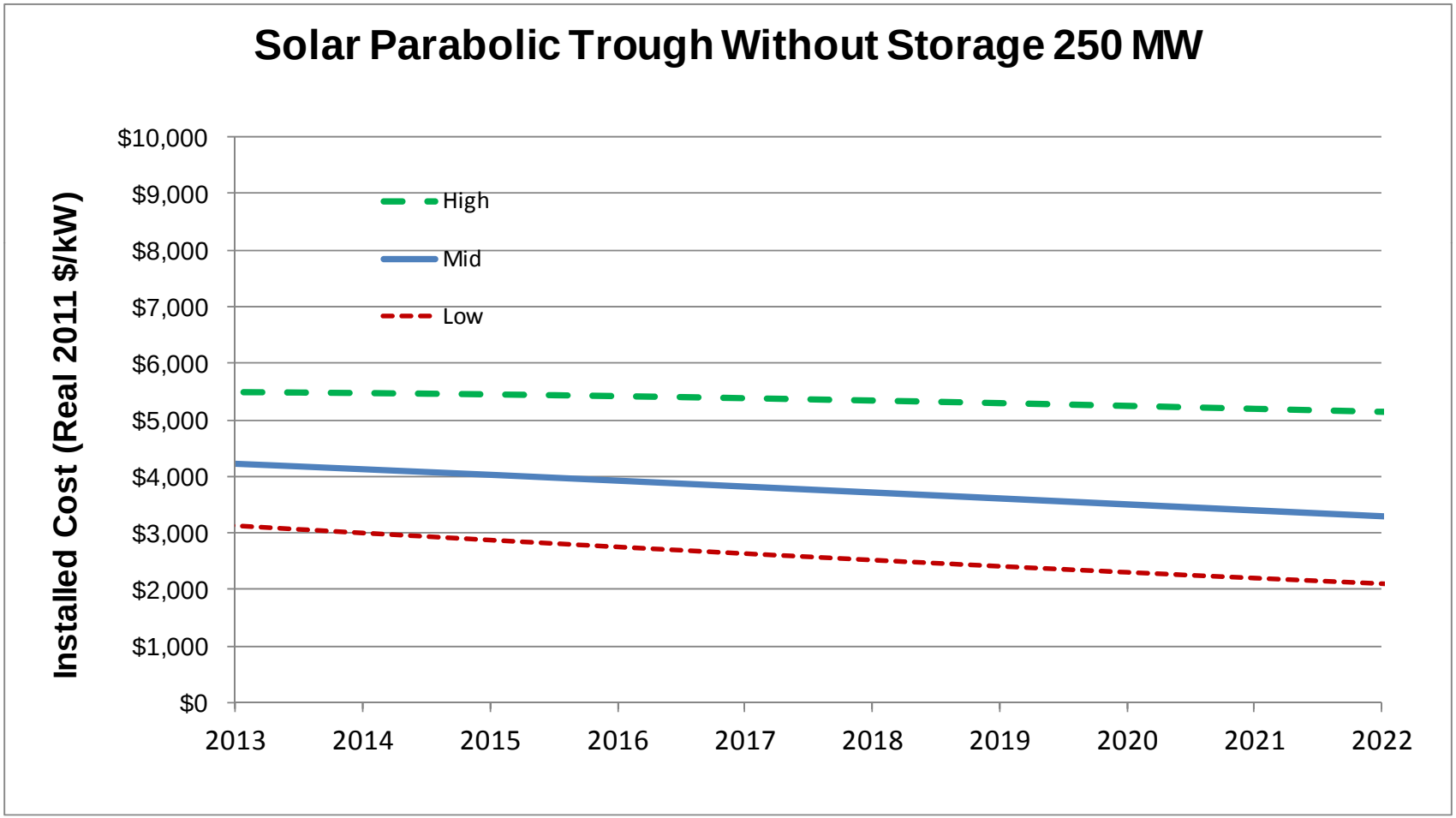

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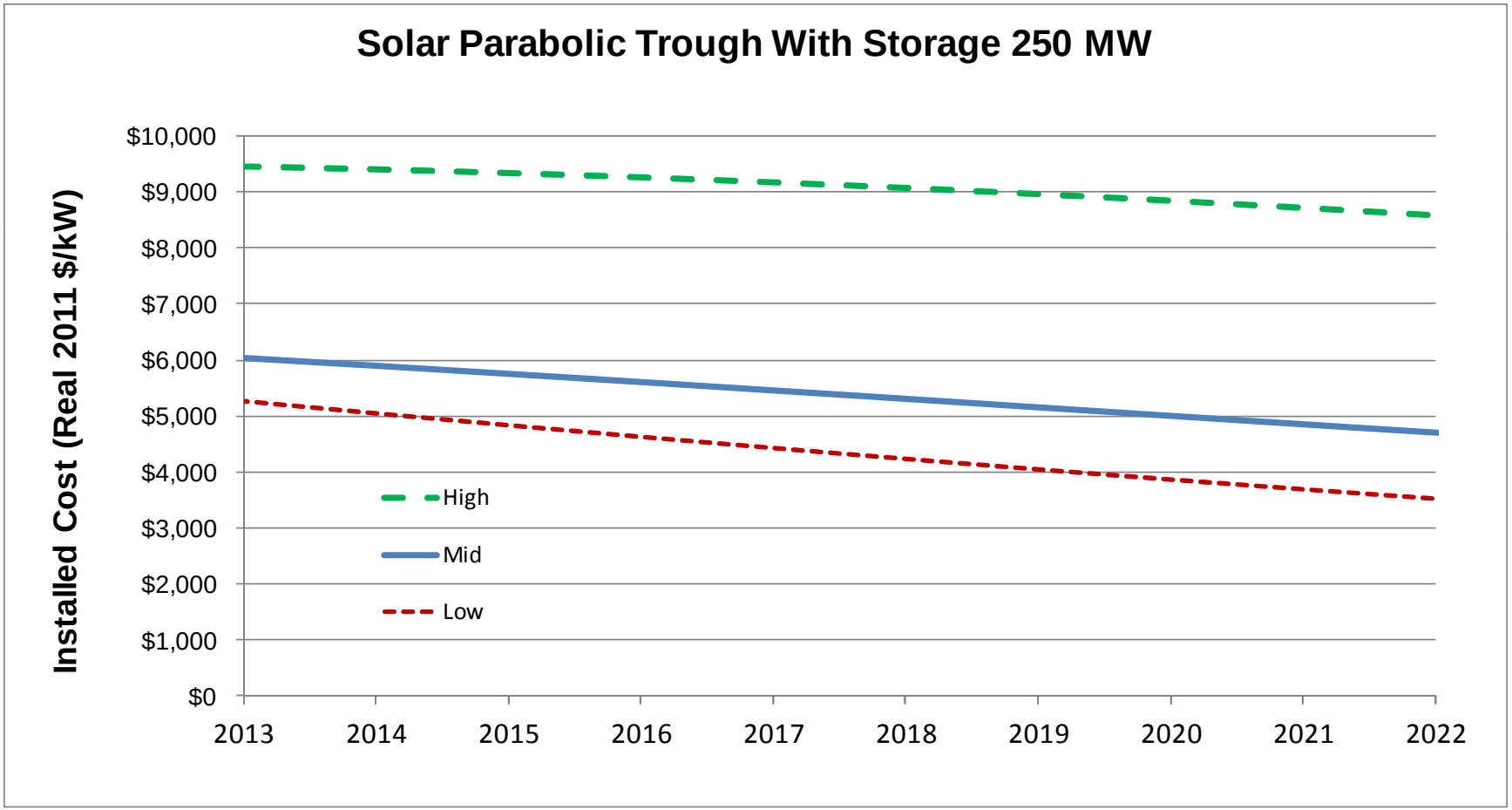
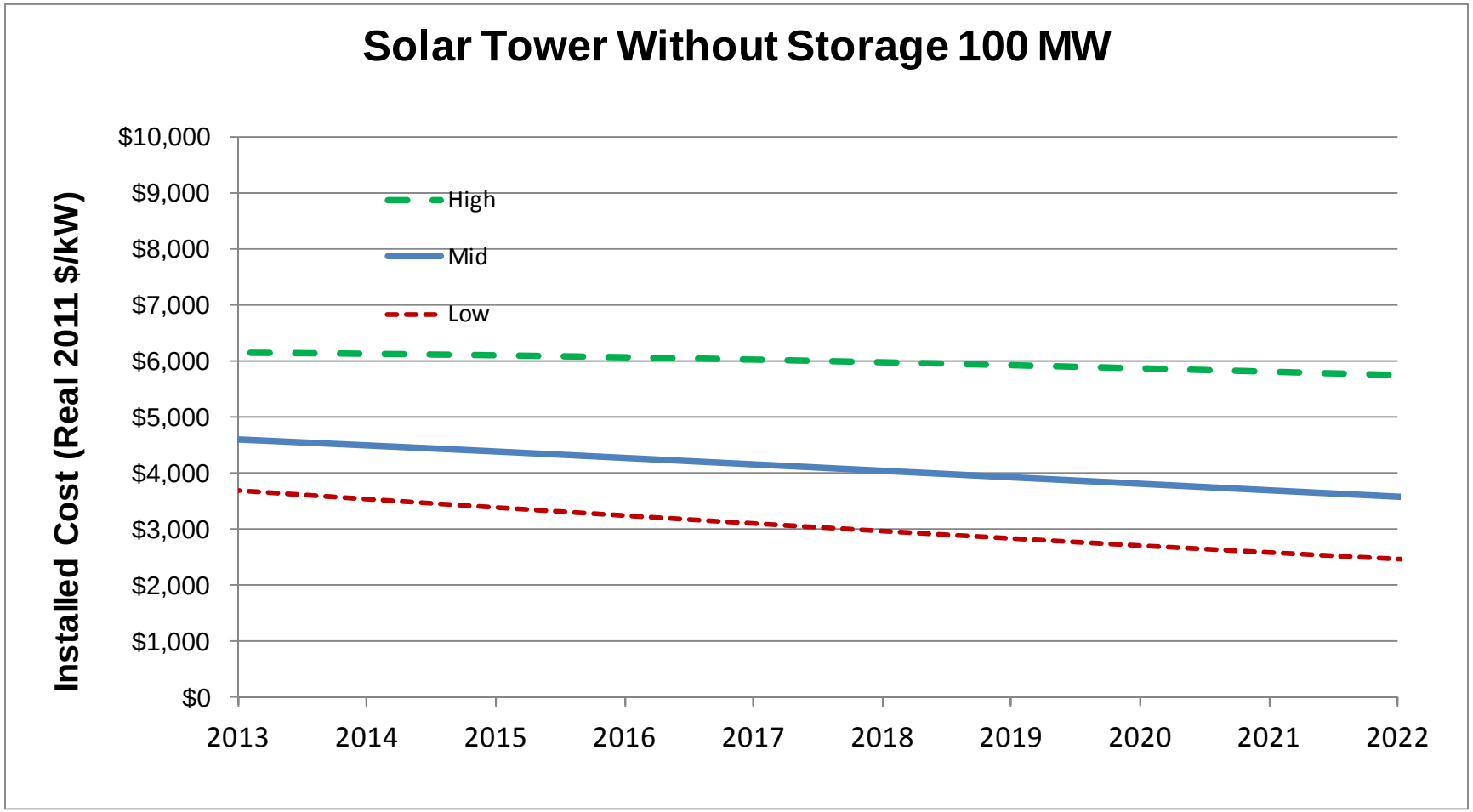


Merchant Installed Costs 2012 -2022



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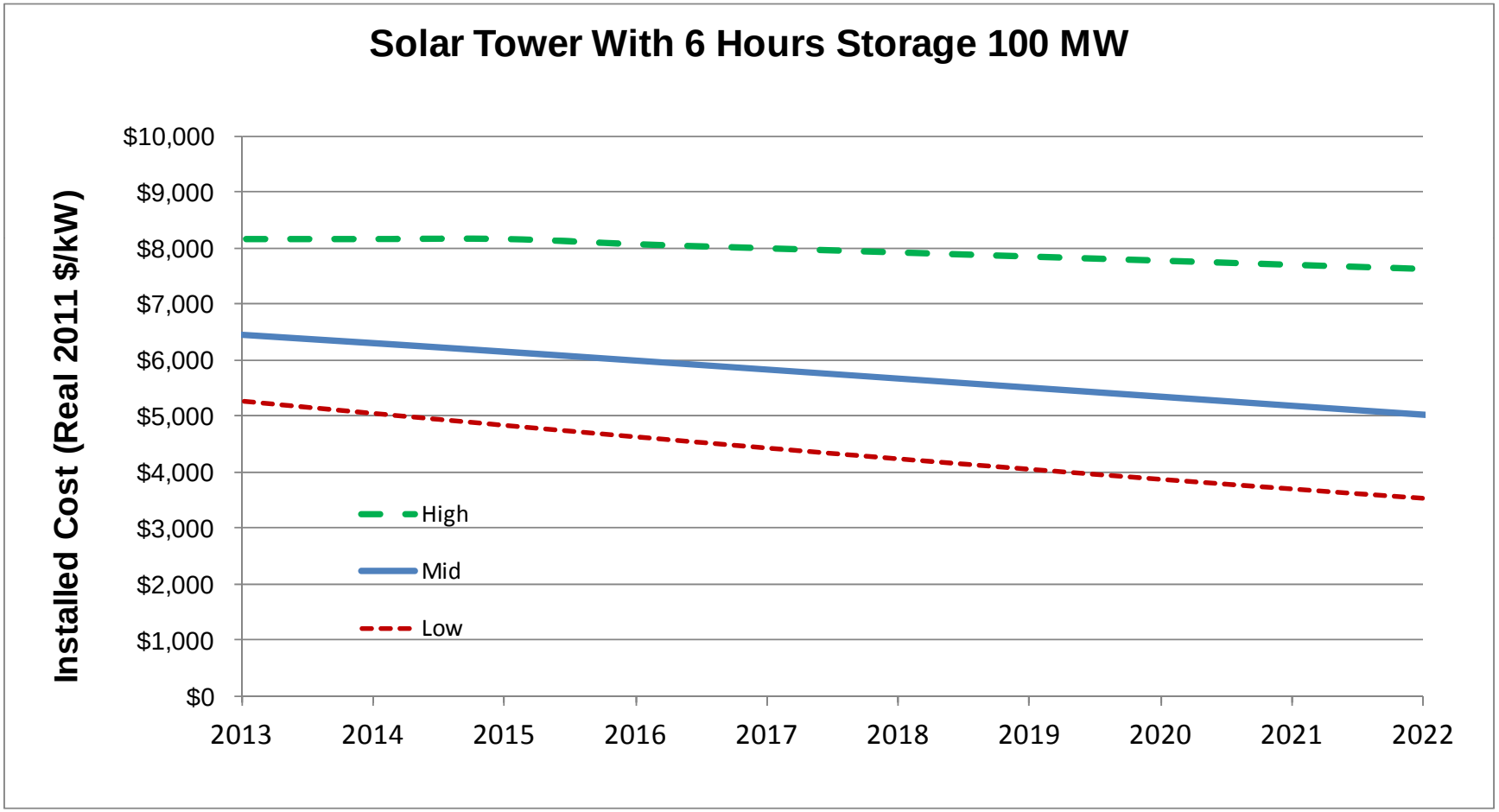
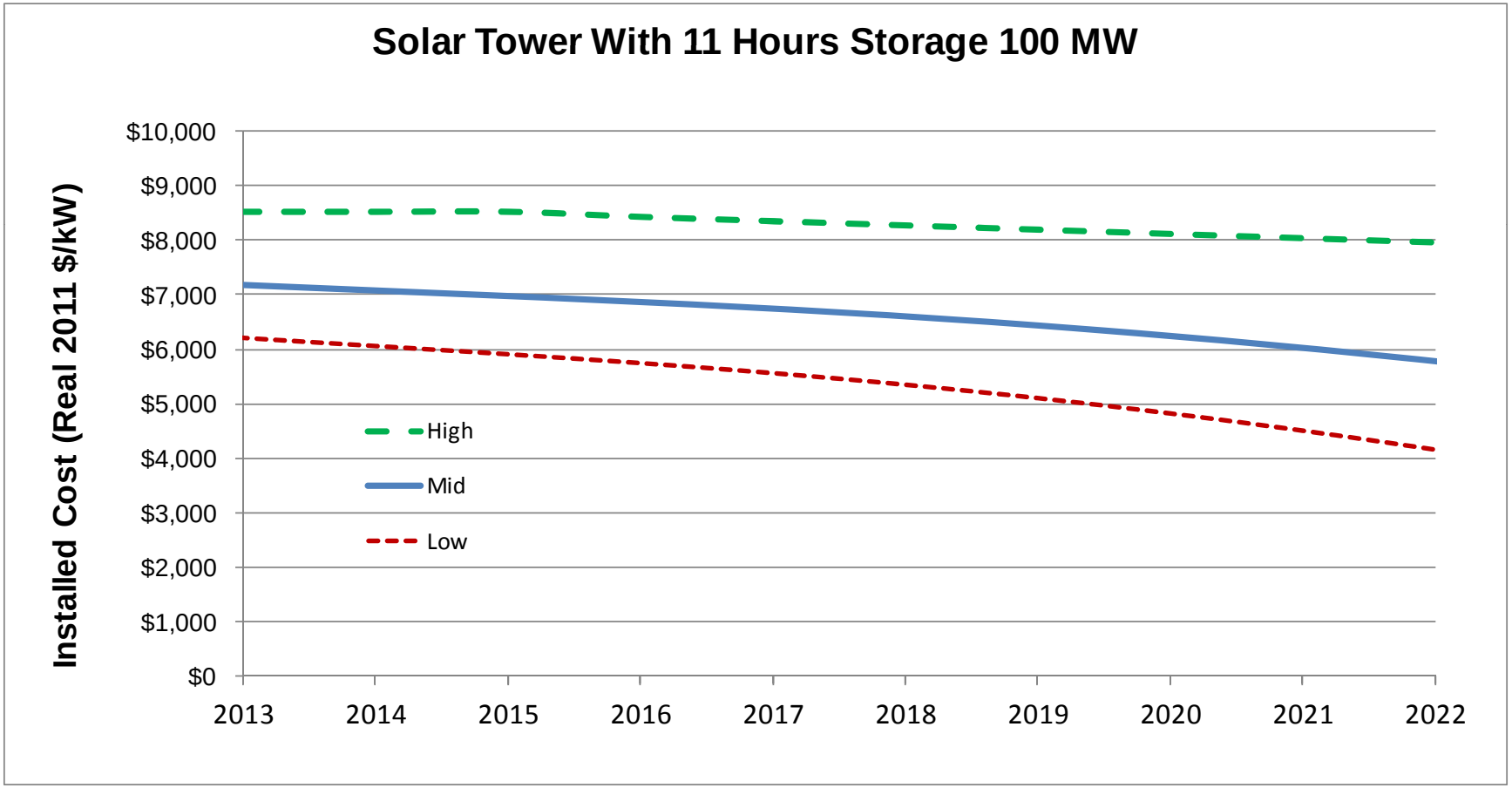
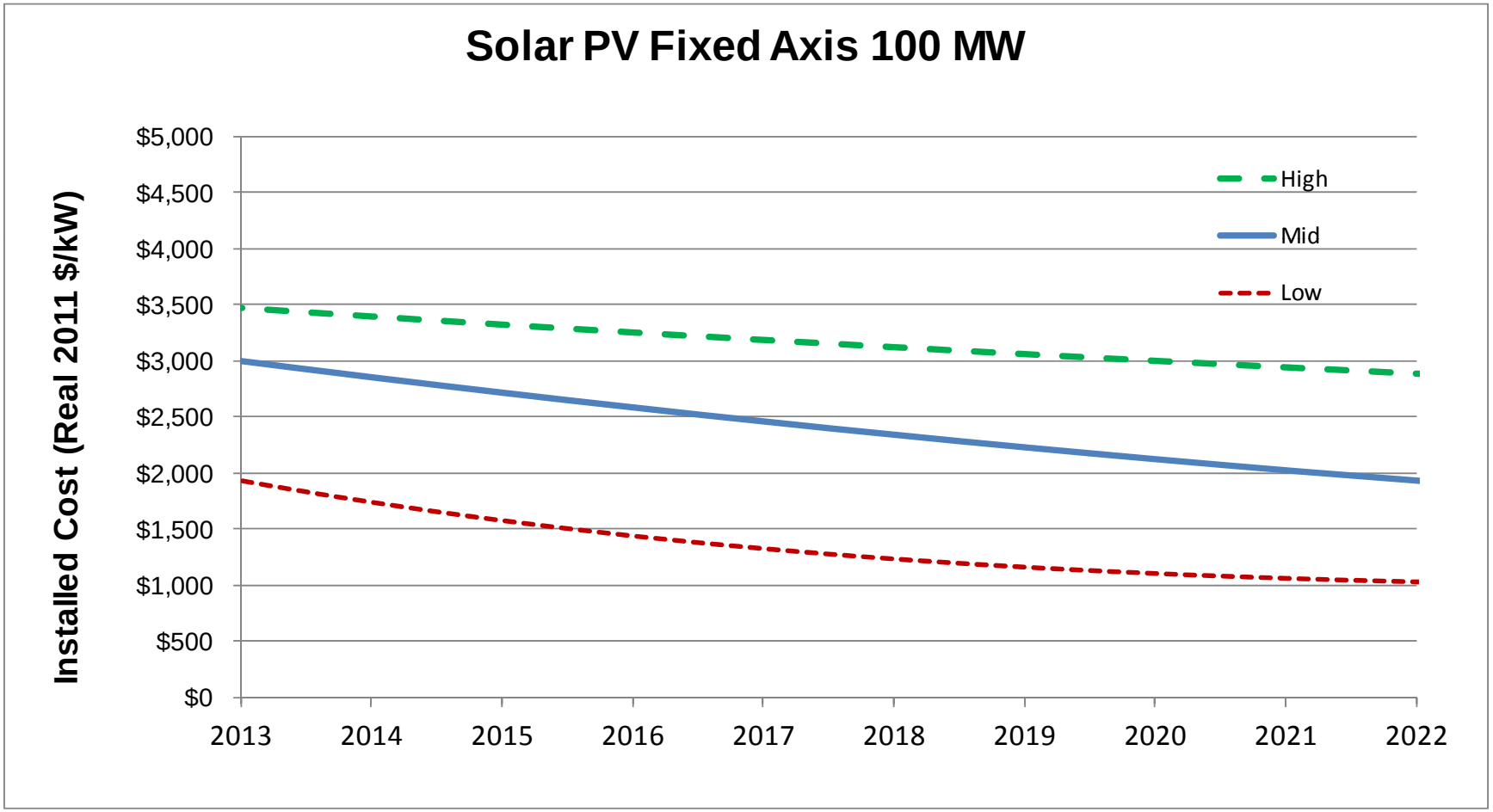


Merchant Installed Costs 2012 -2022



Merchant Installed Costs 2012 -2022



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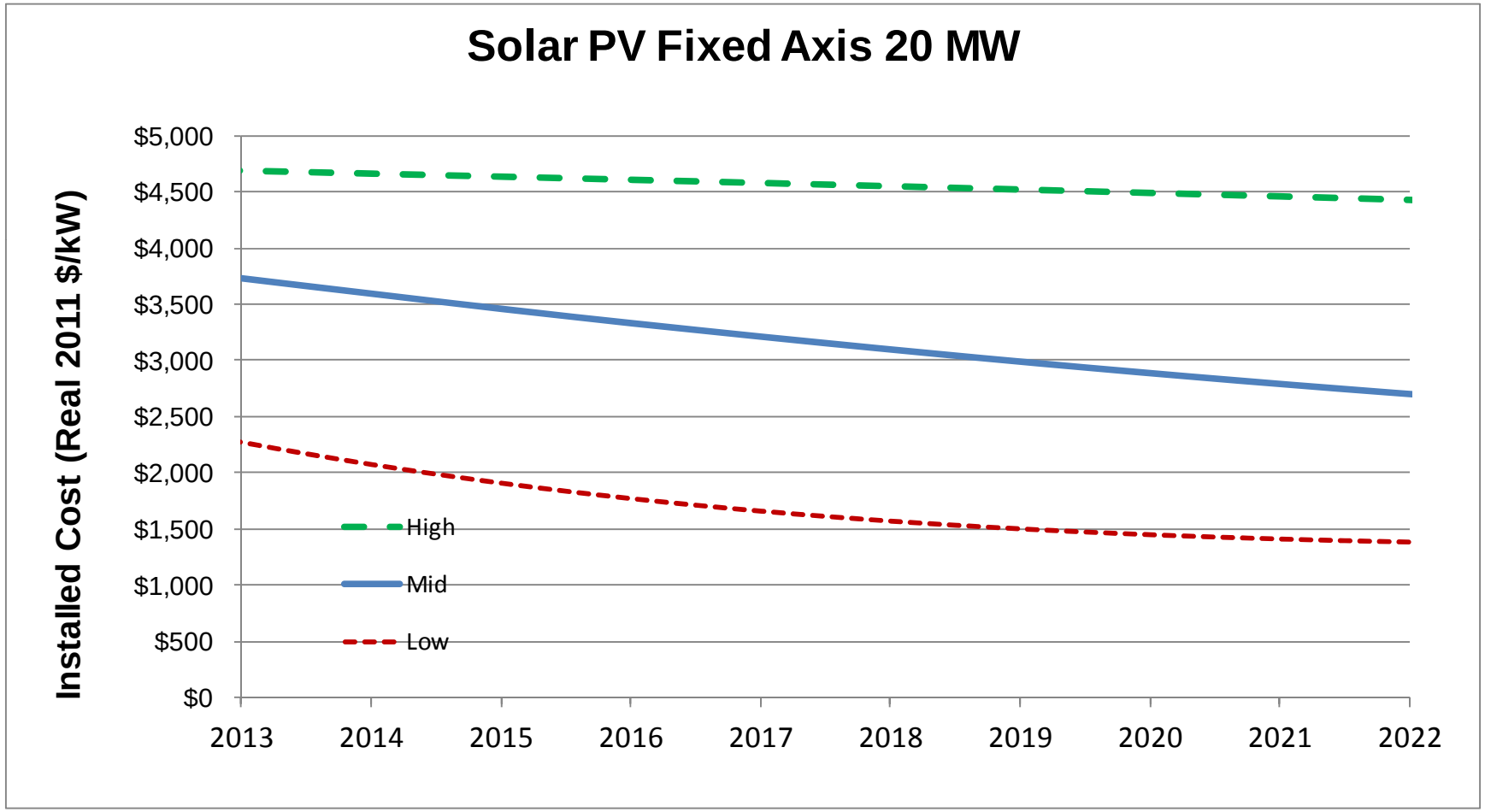

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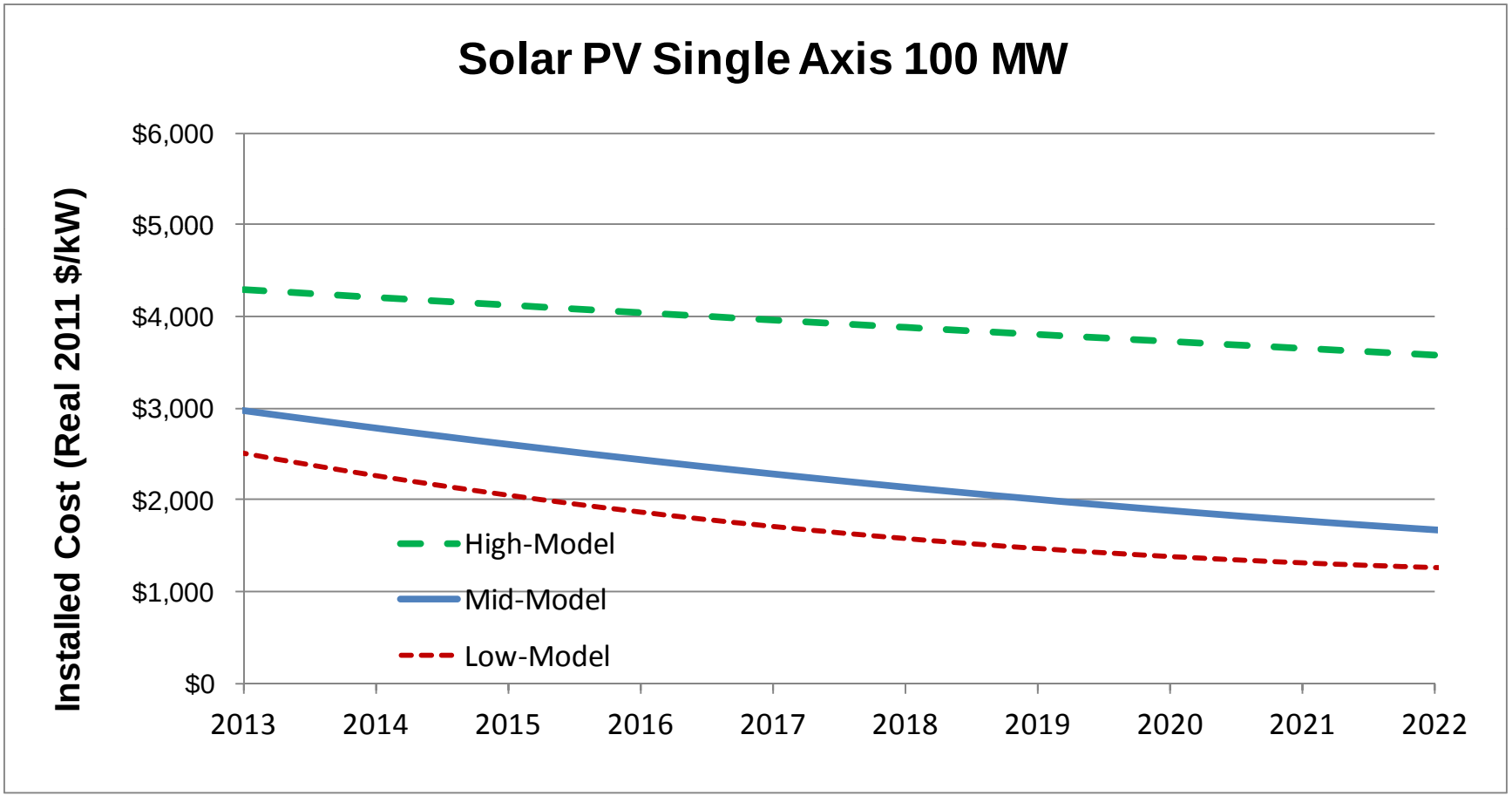

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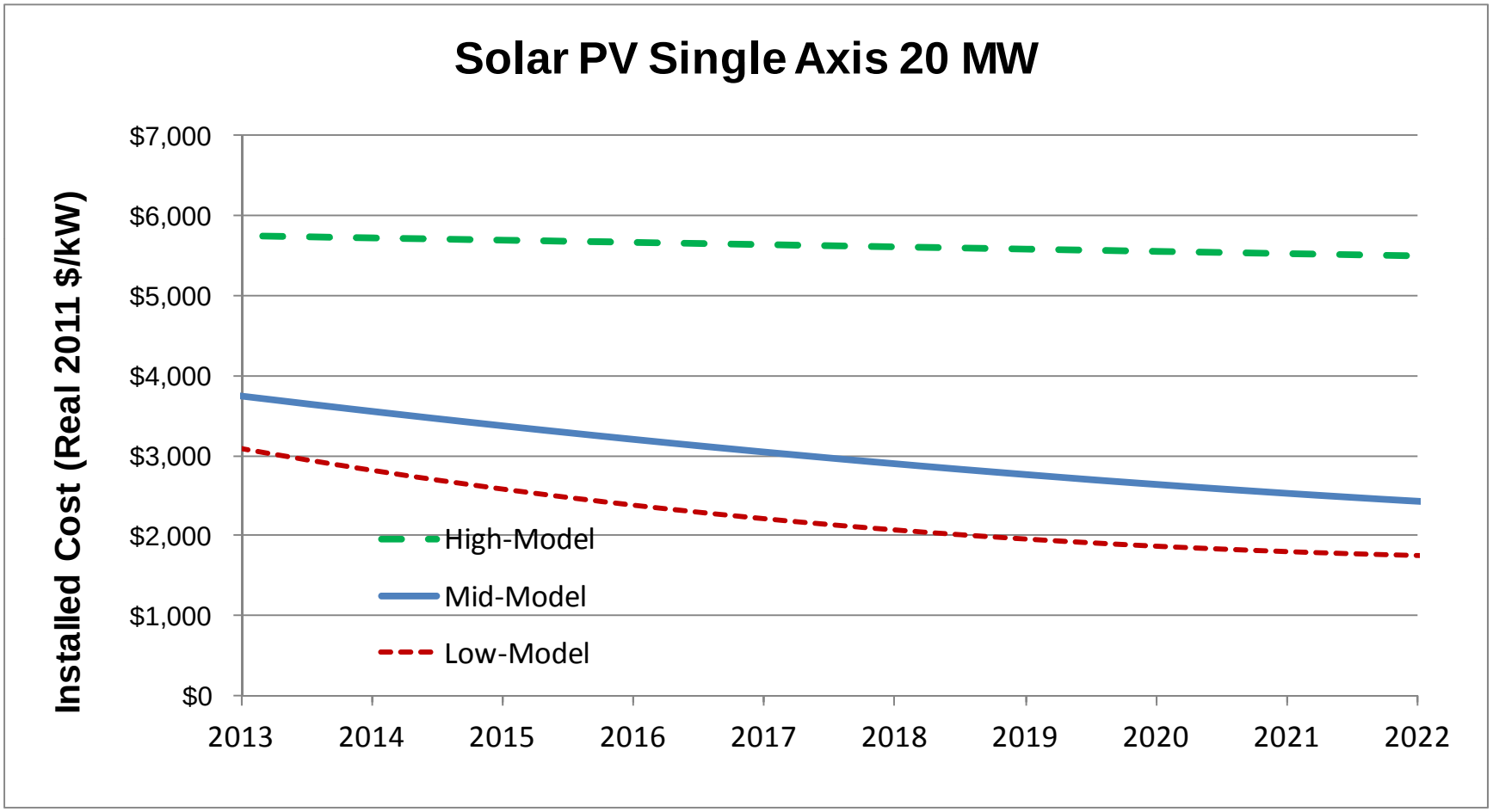

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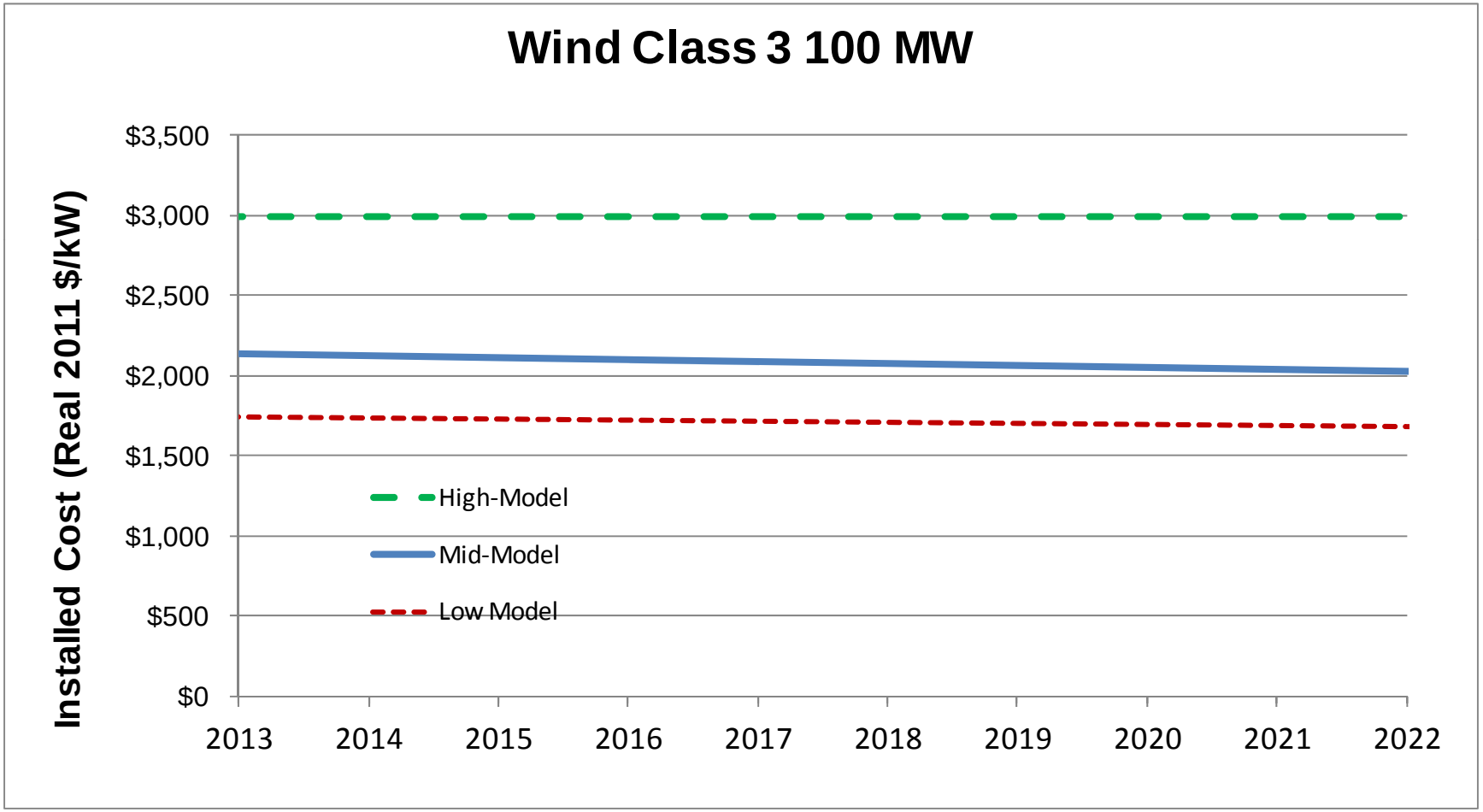

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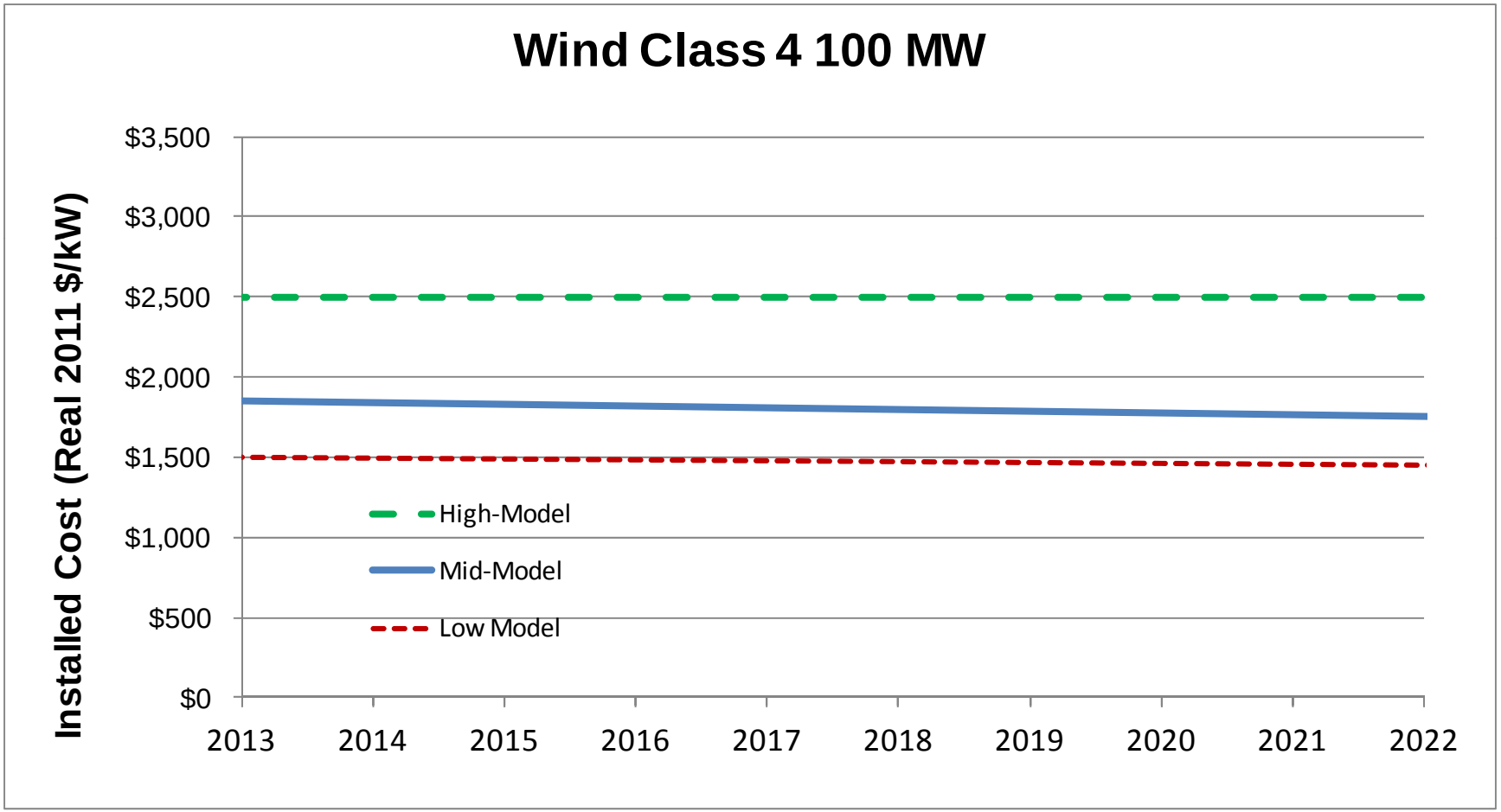
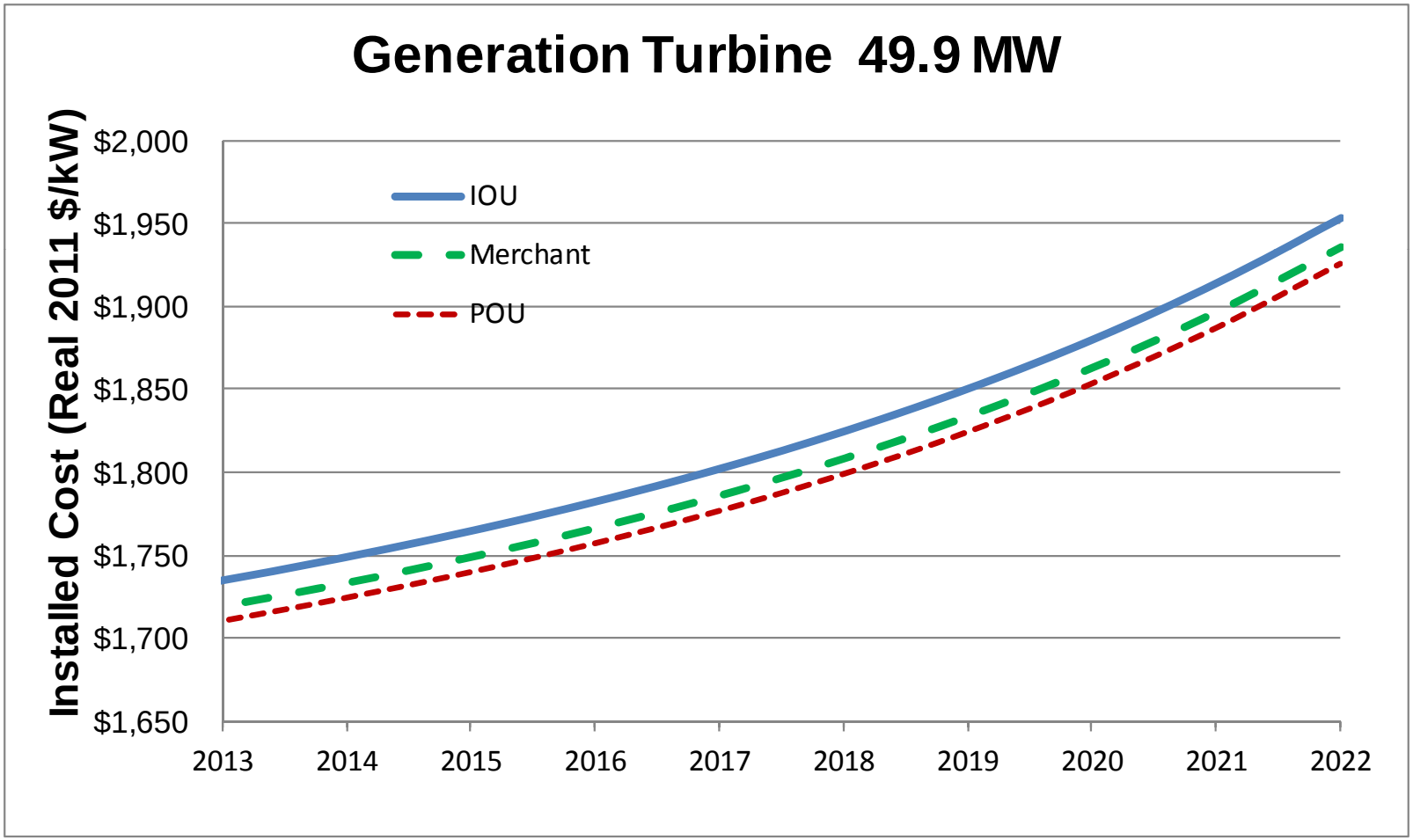
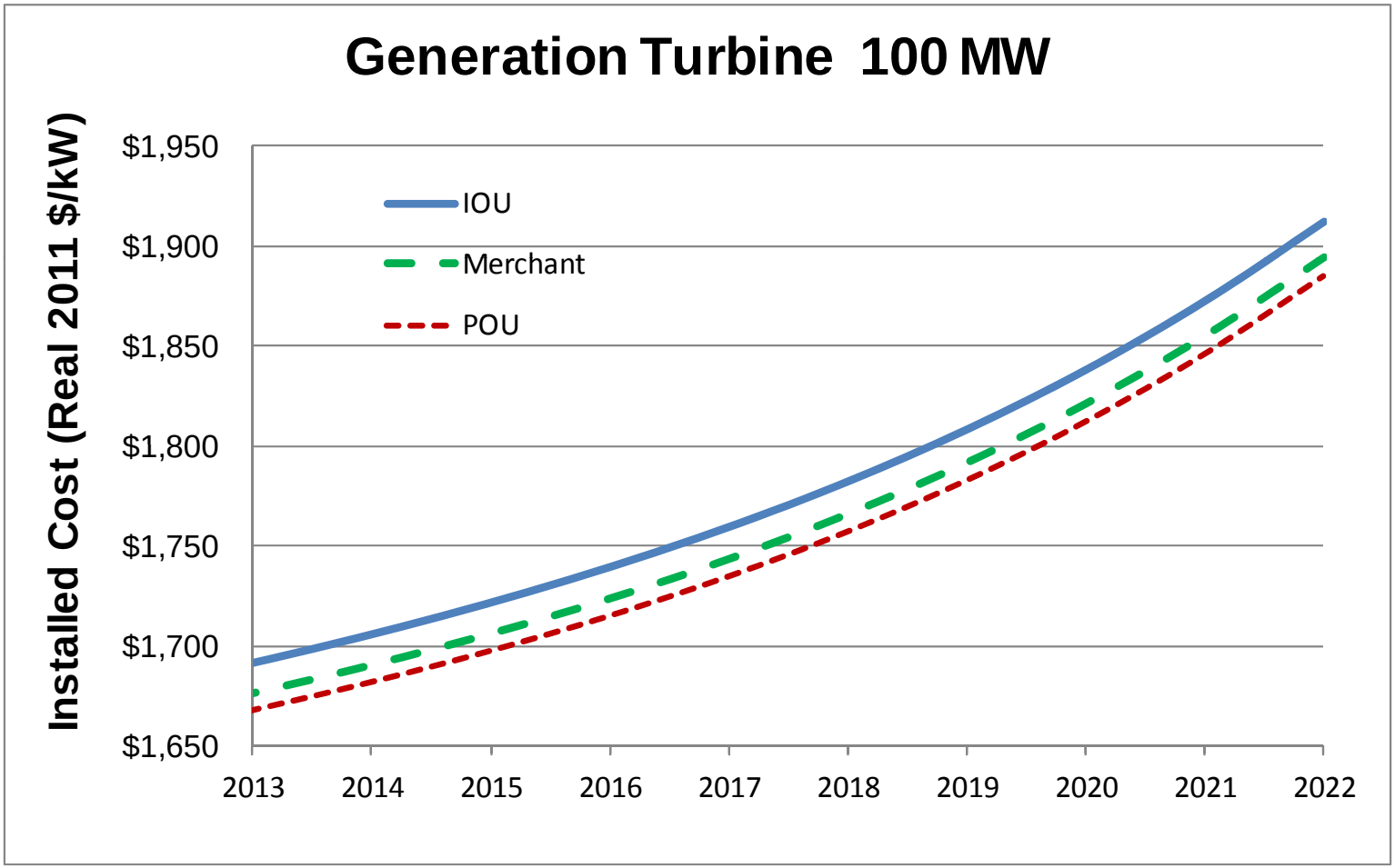


Costs by Developer

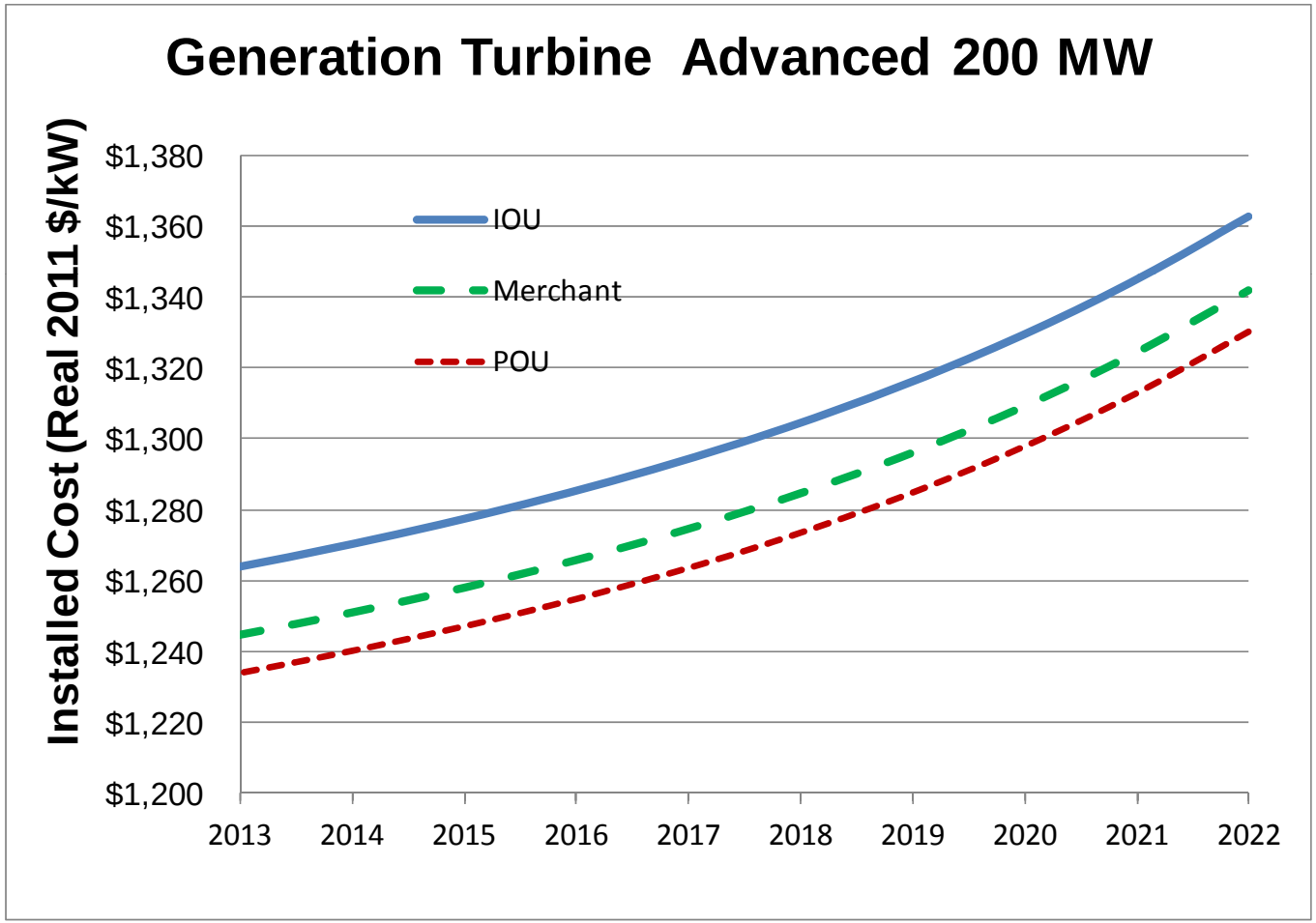
Mid-Cost Installed Costs by Developer



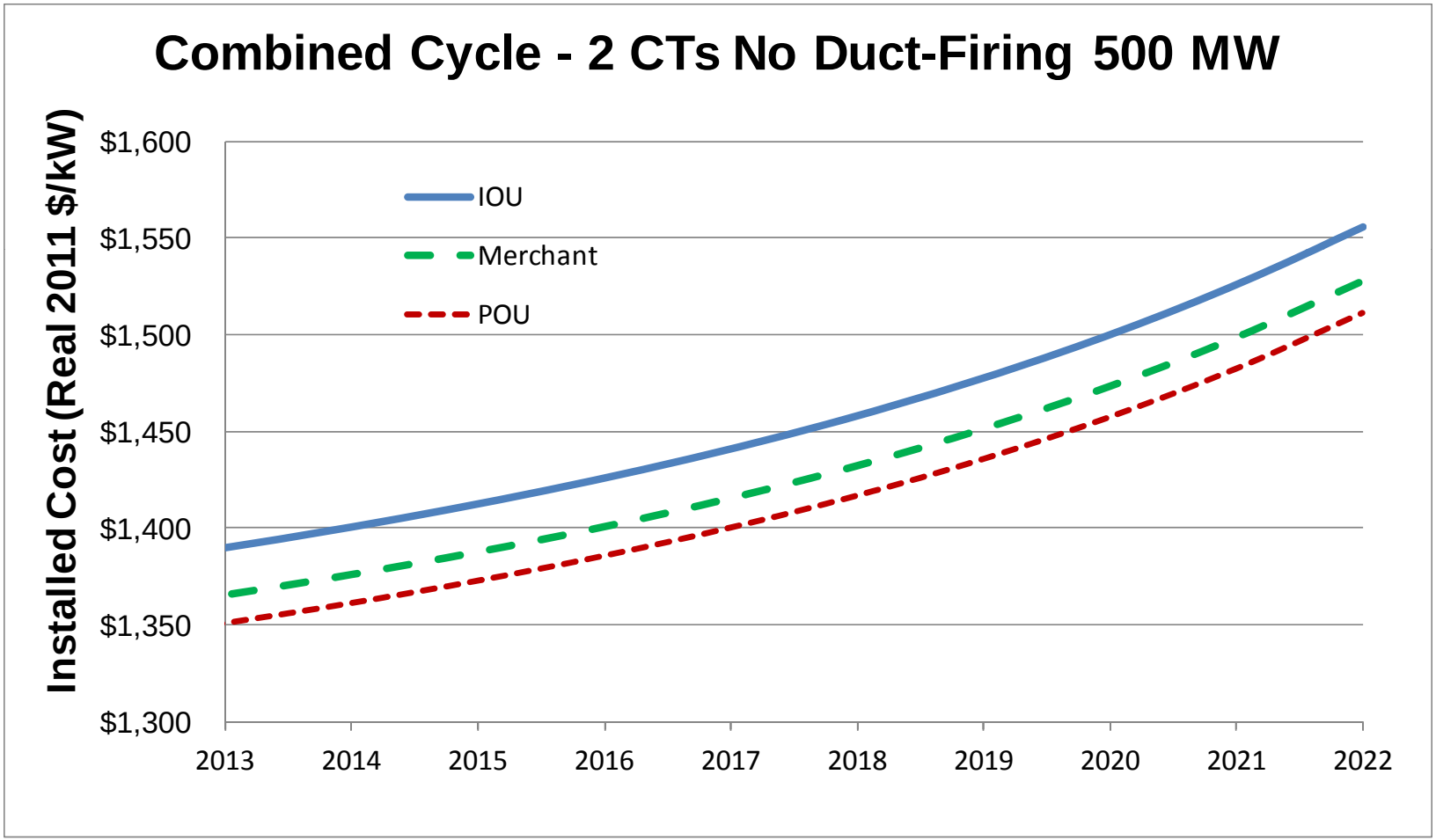
Mid-Cost Installed Costs by Developer



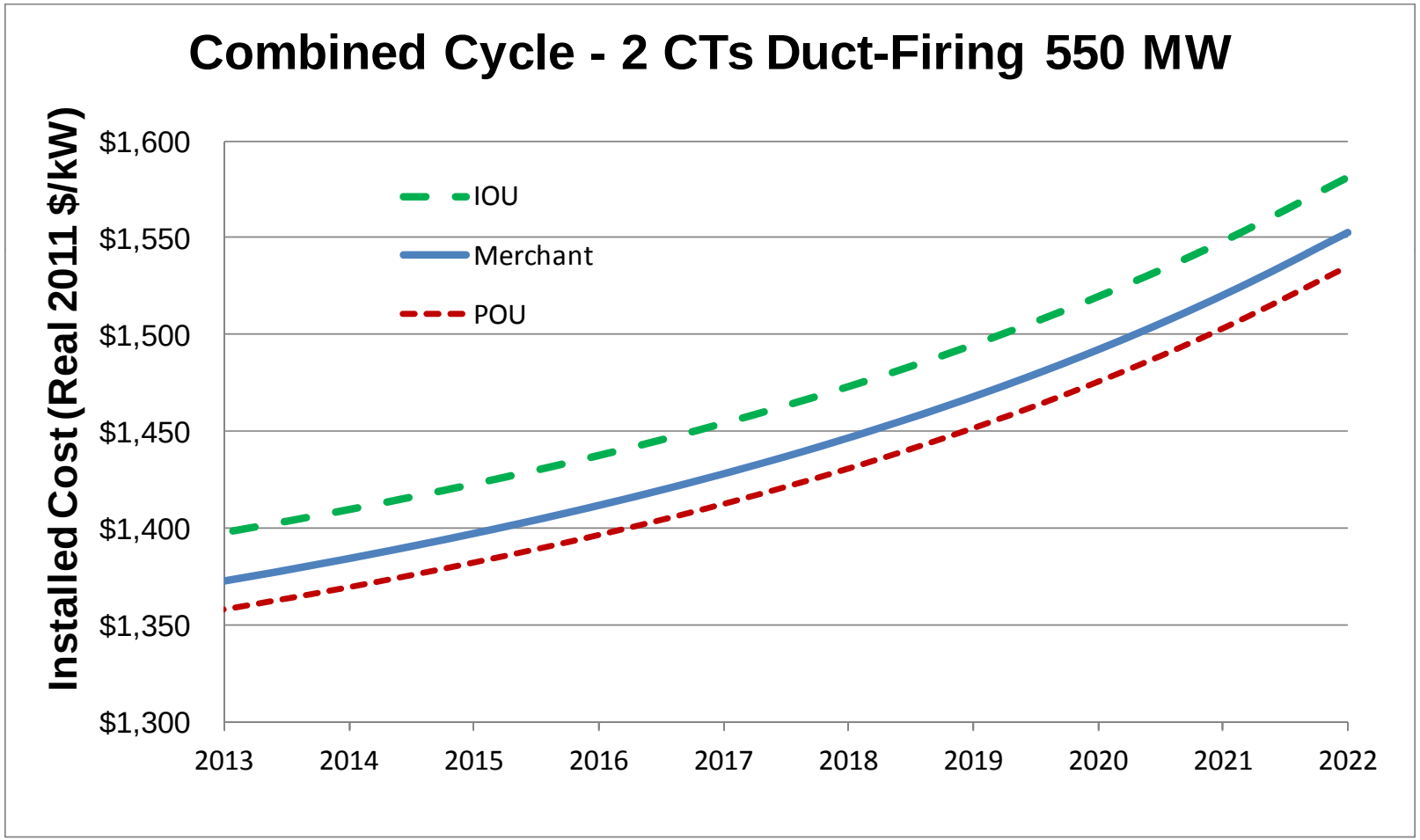
Mid-Cost Installed Costs by Developer



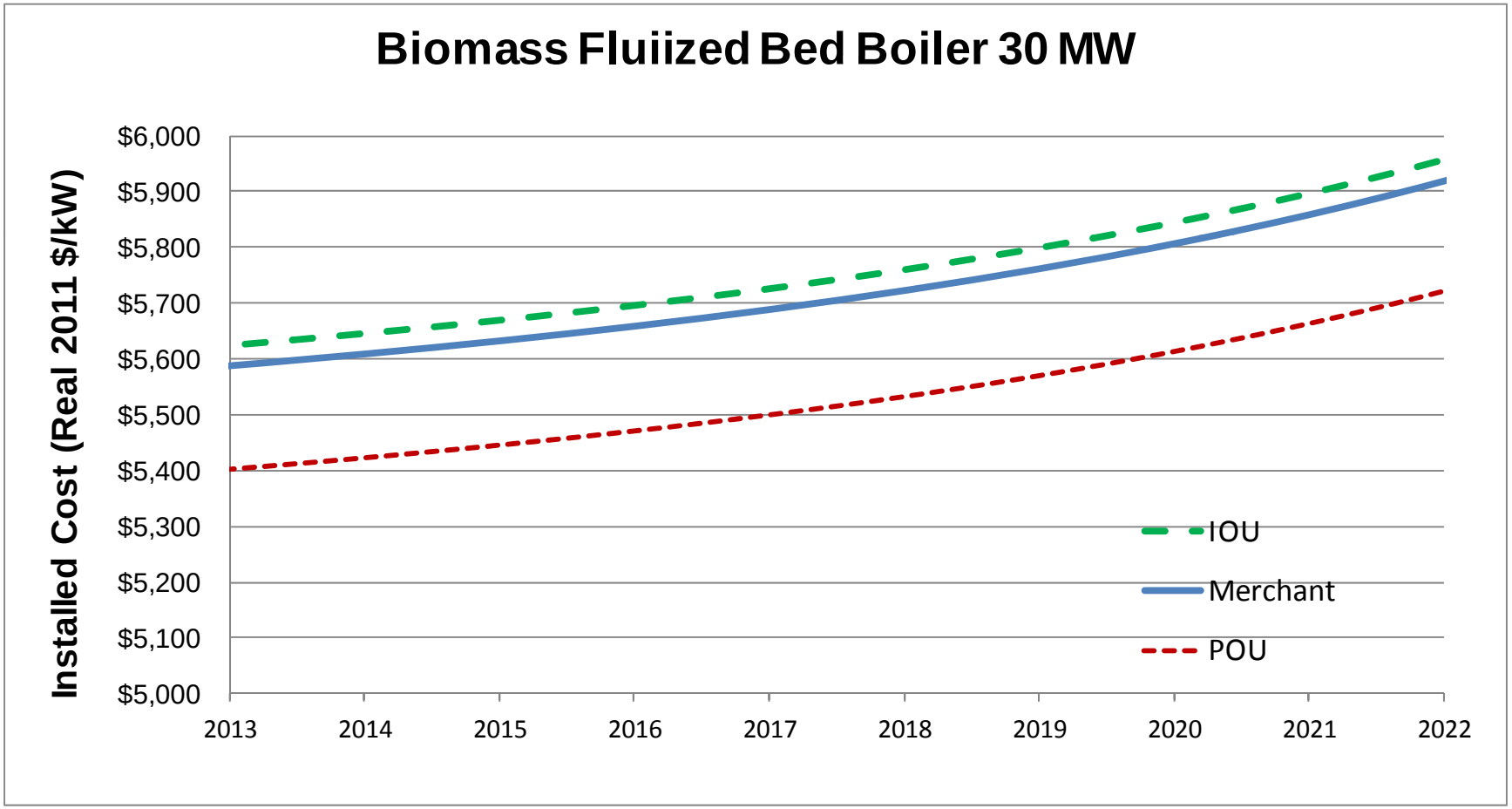
Mid-Cost Installed Costs by Developer



Mid-Cost Installed Costs by Developer



Mid-Cost Installed Costs by Developer



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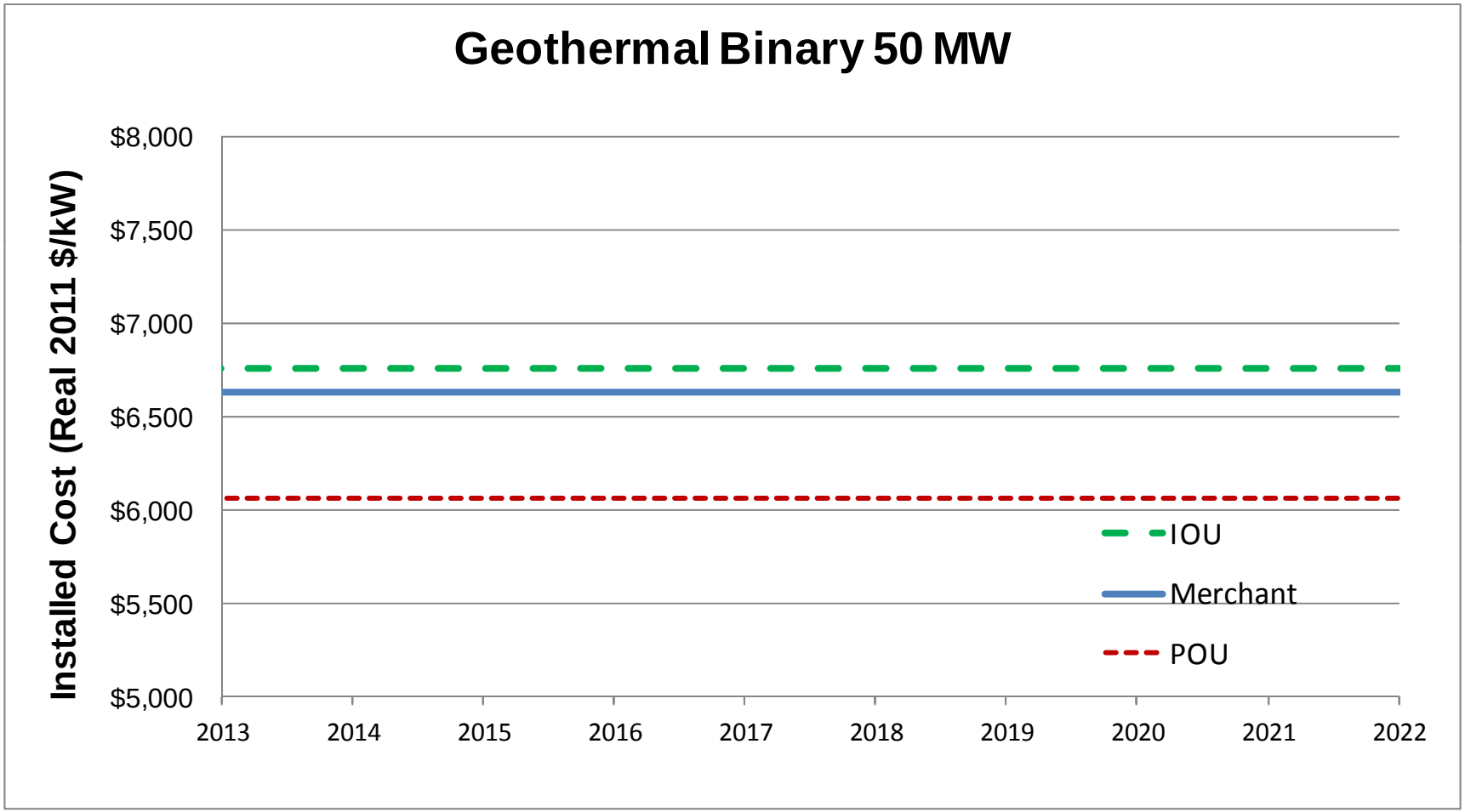
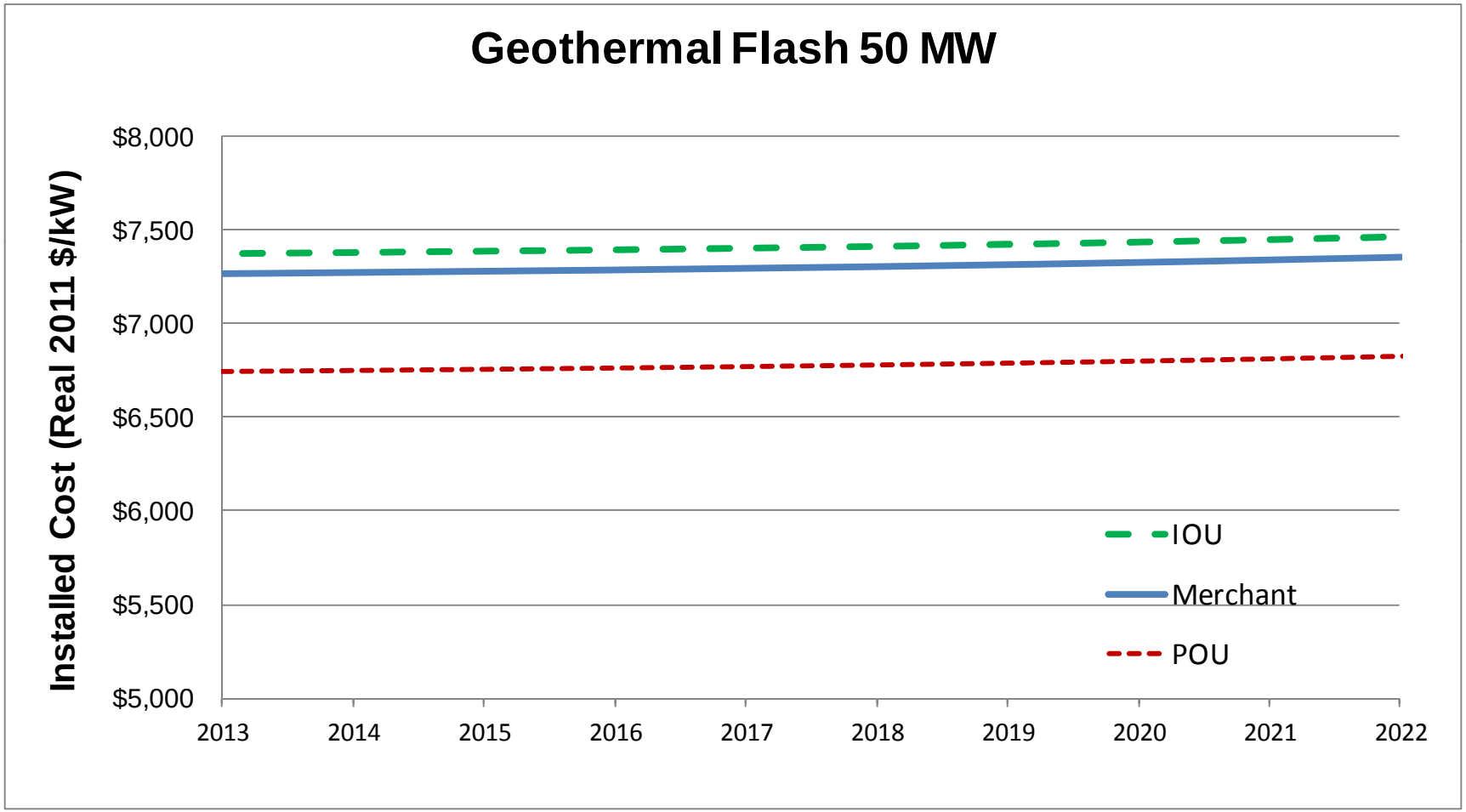


Mid-Cost Installed Costs by Developer



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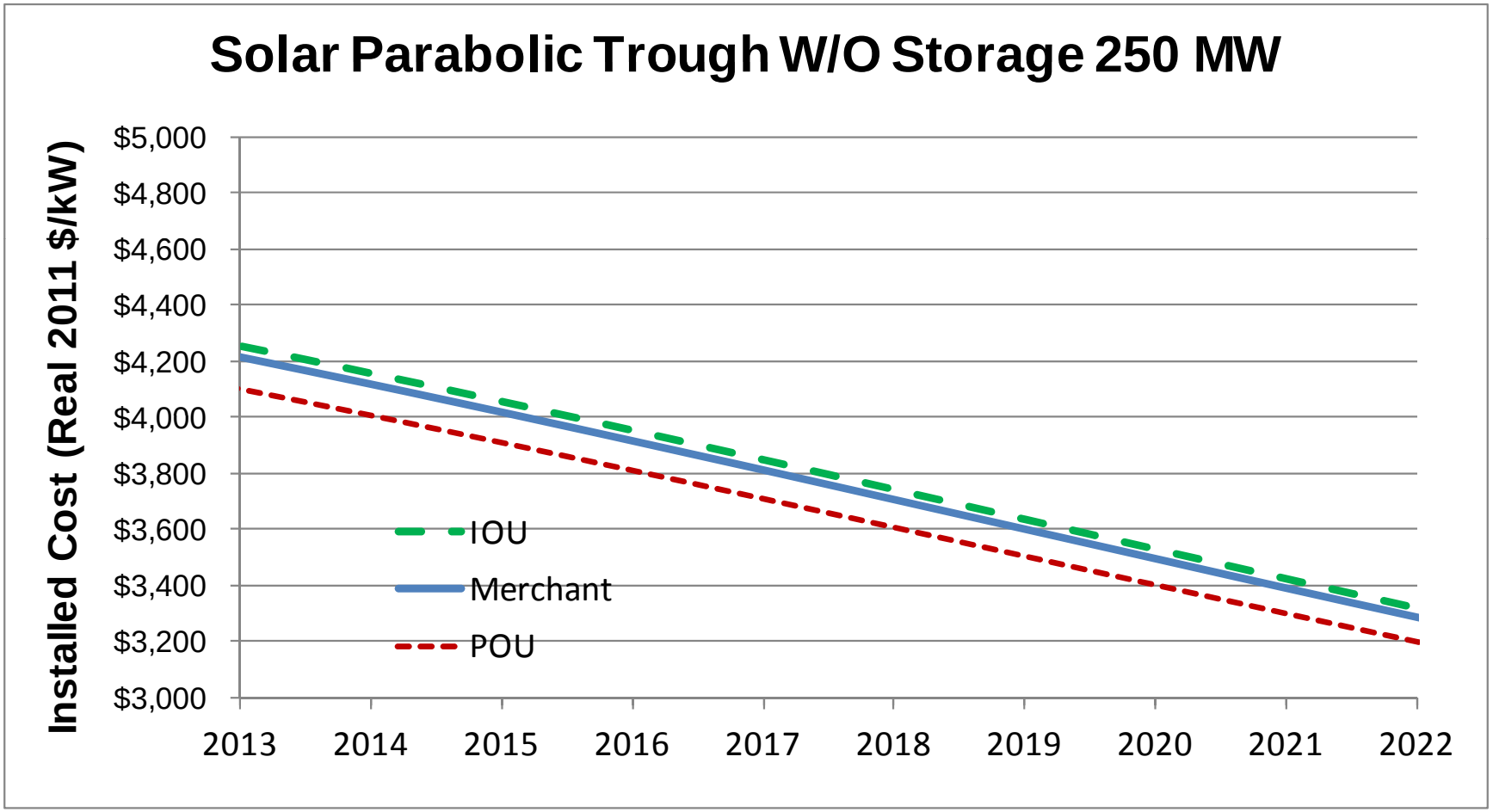

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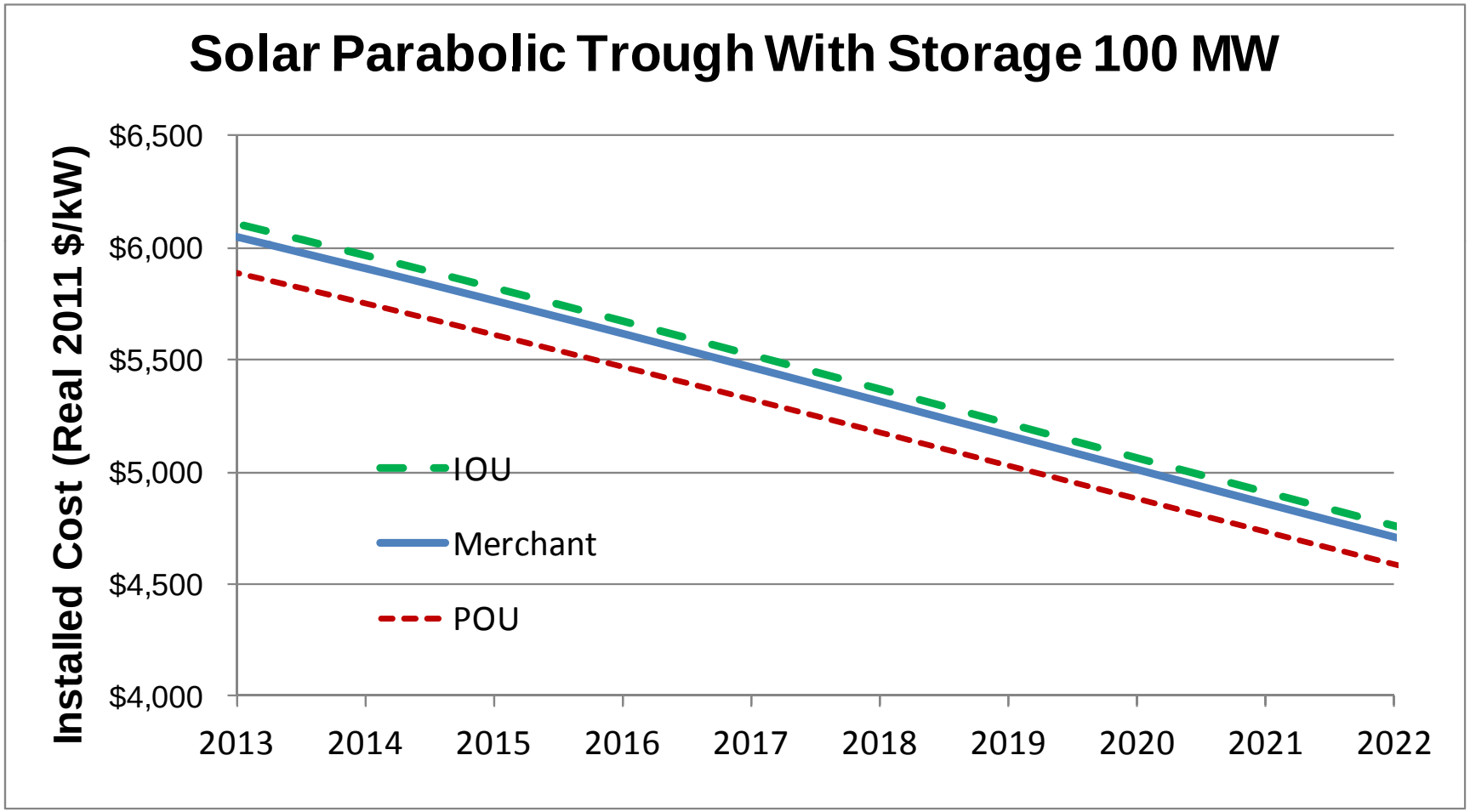
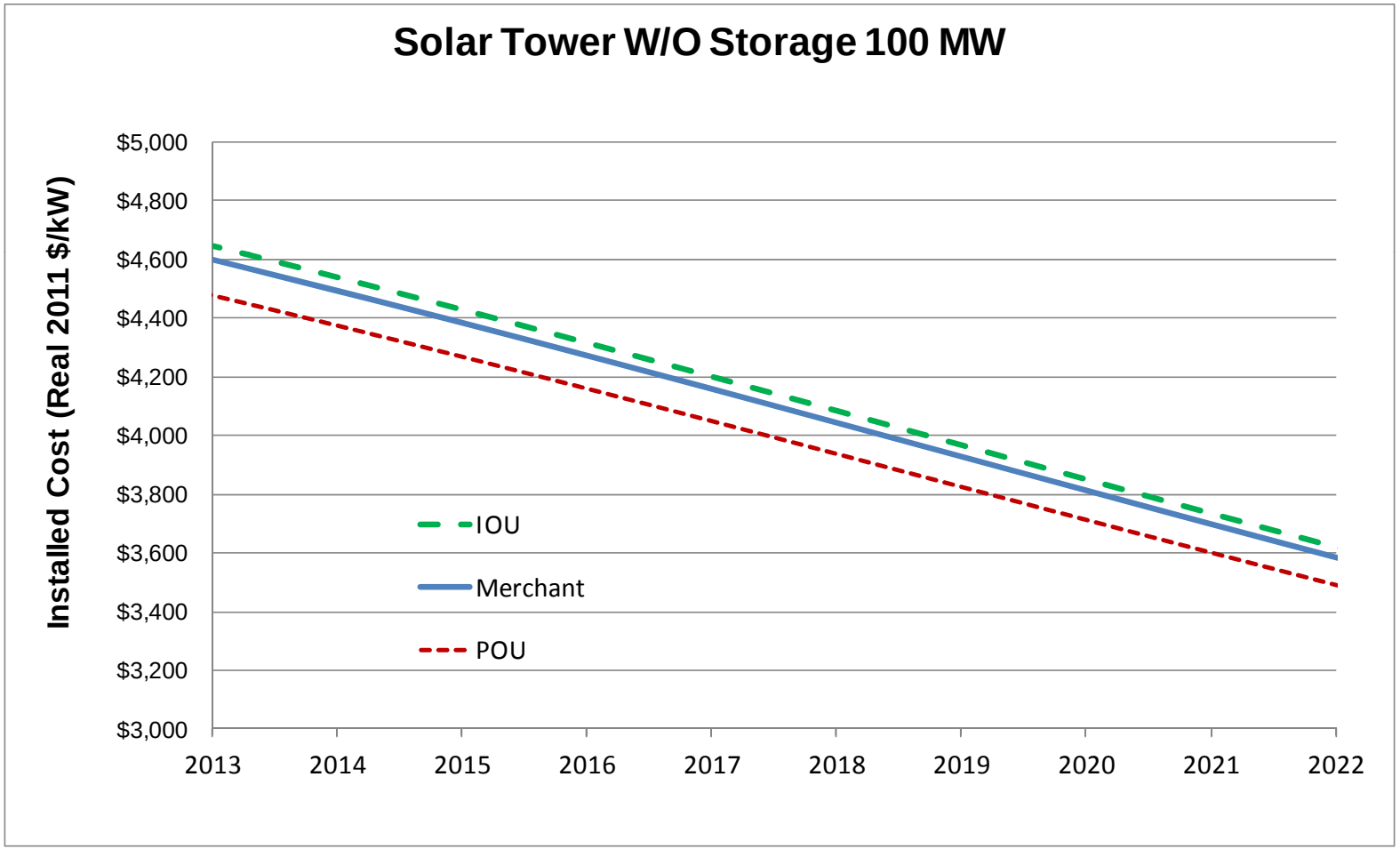
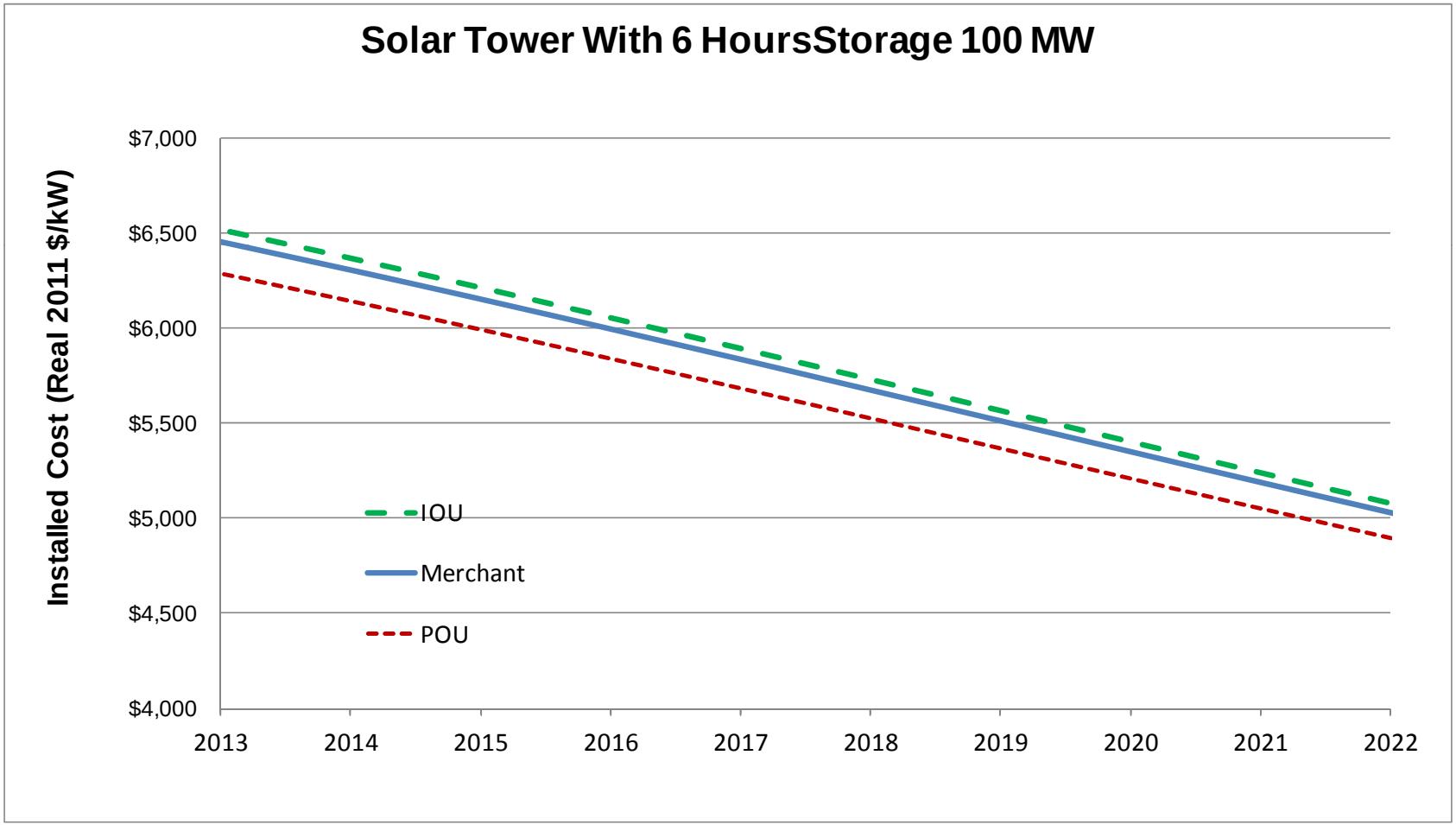


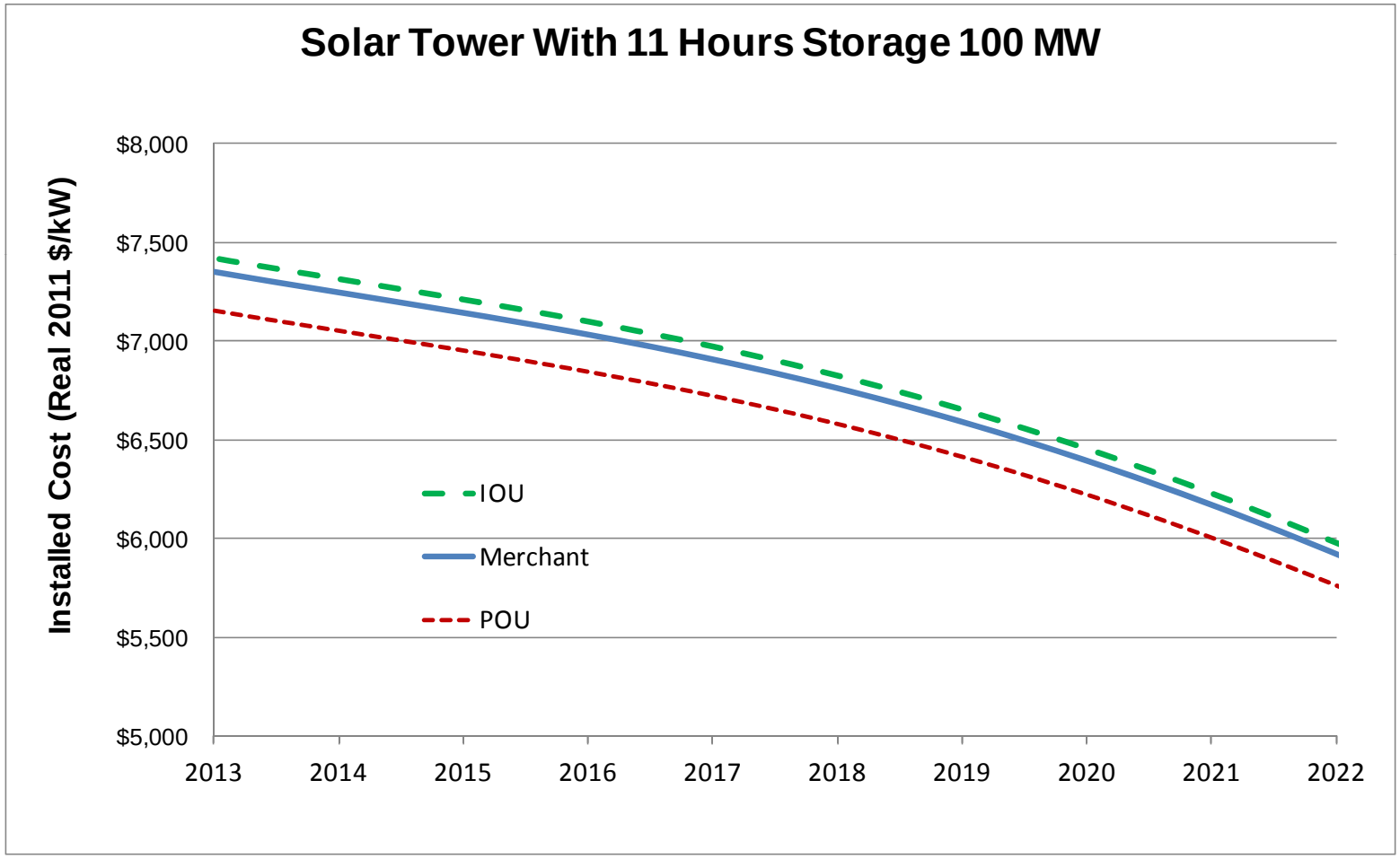
Mid-Cost Installed Costs by Developer



Mid-Cost Installed Costs by Developer



Mid-Cost Installed Costs by Developer



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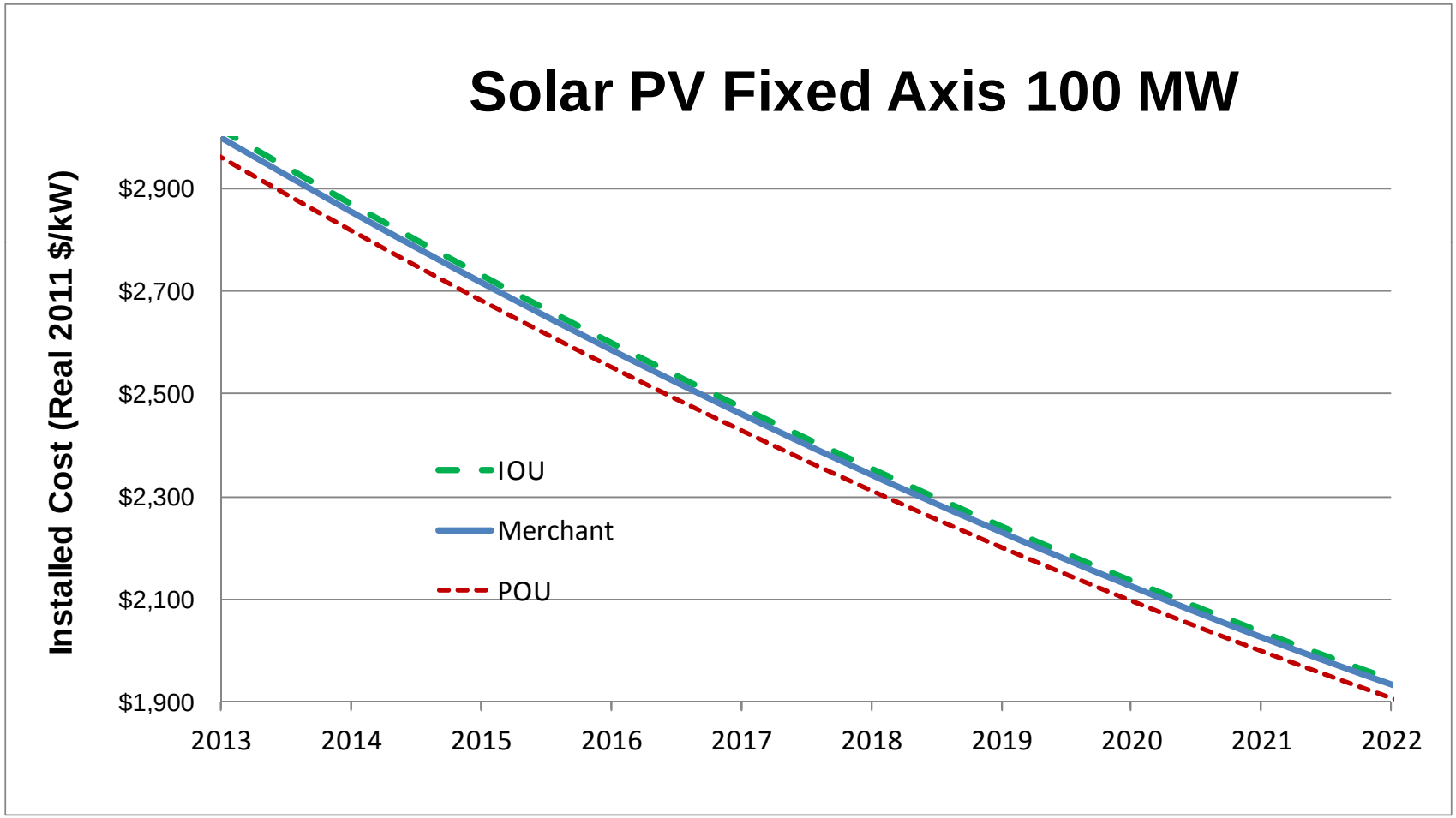

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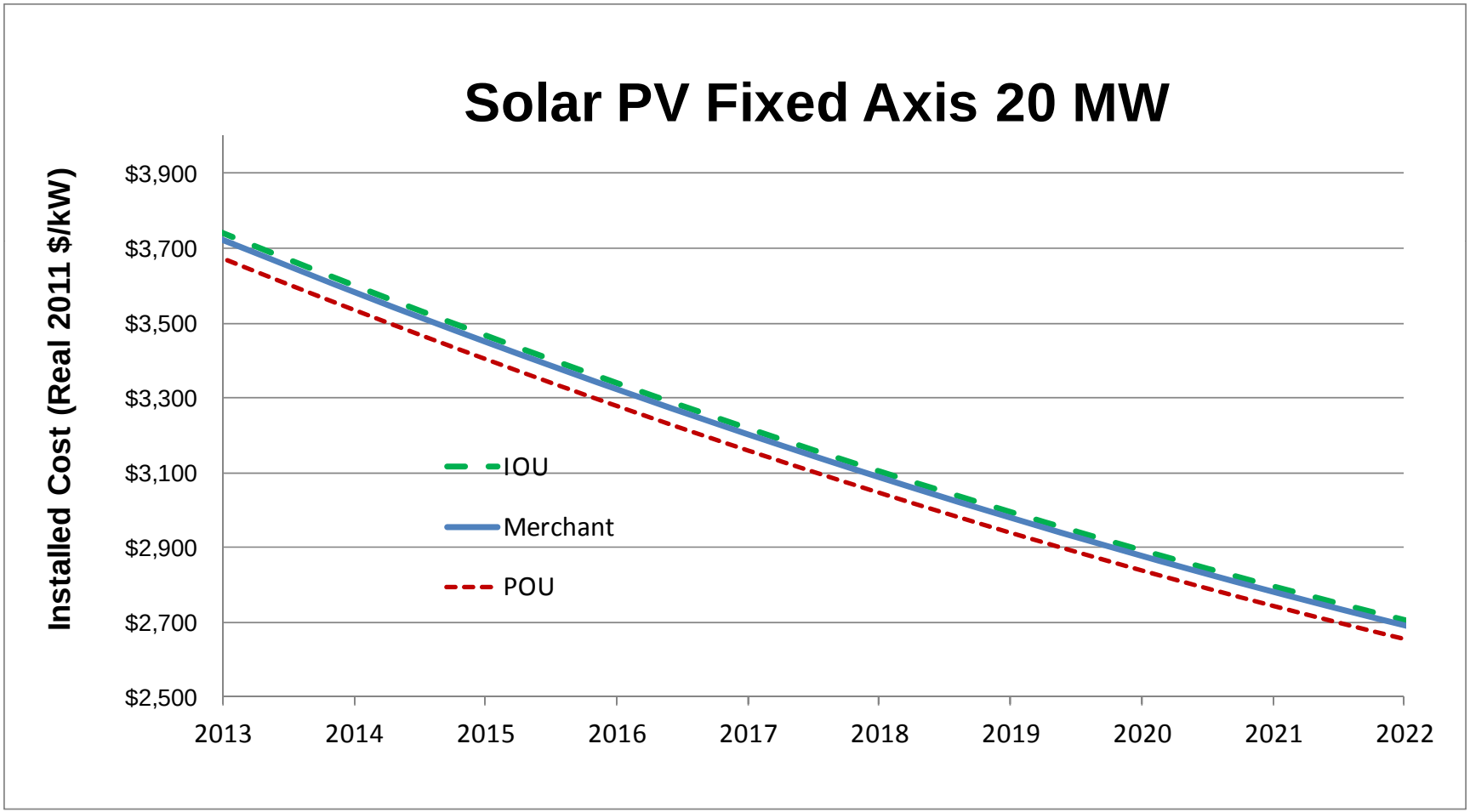
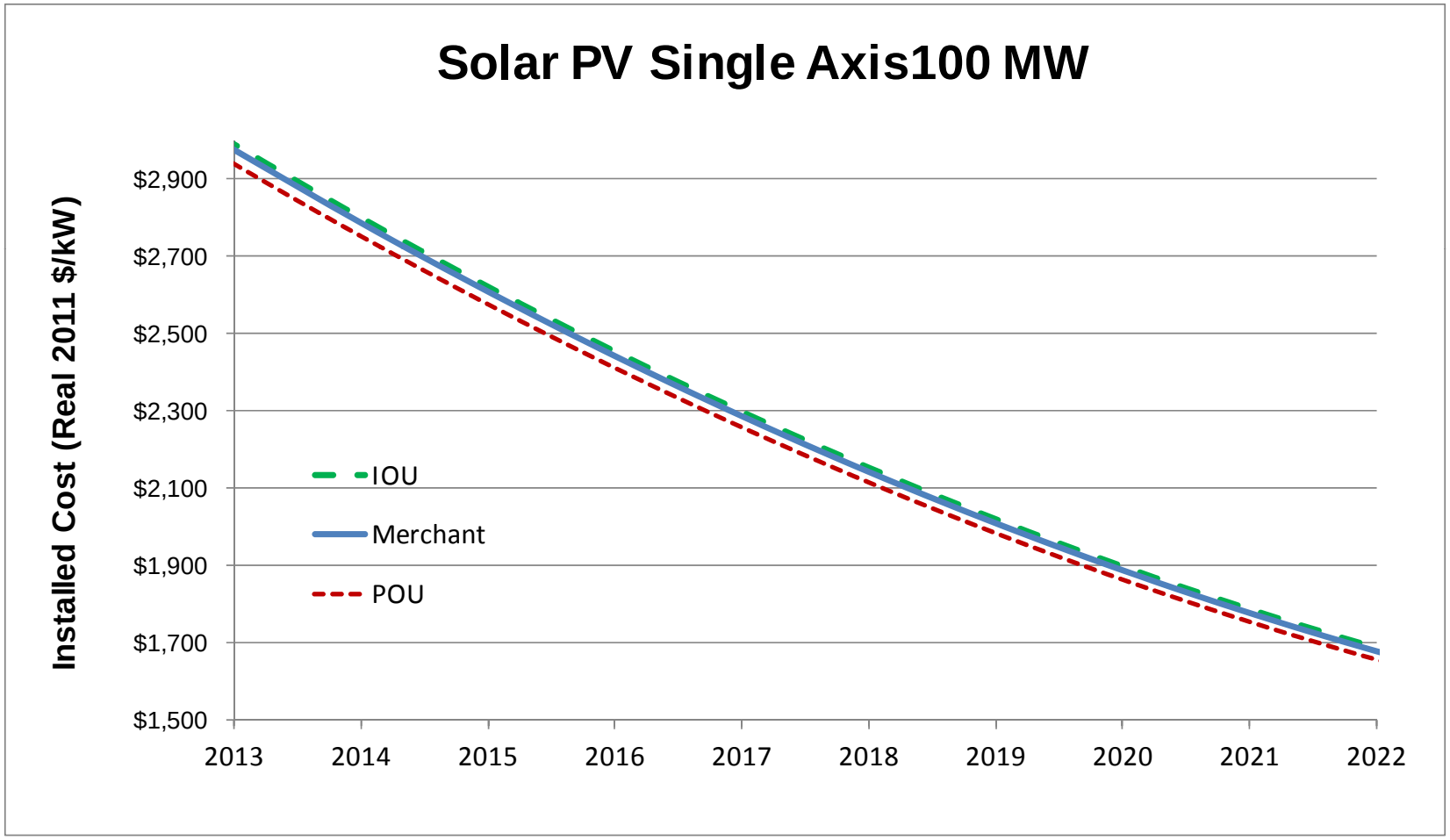
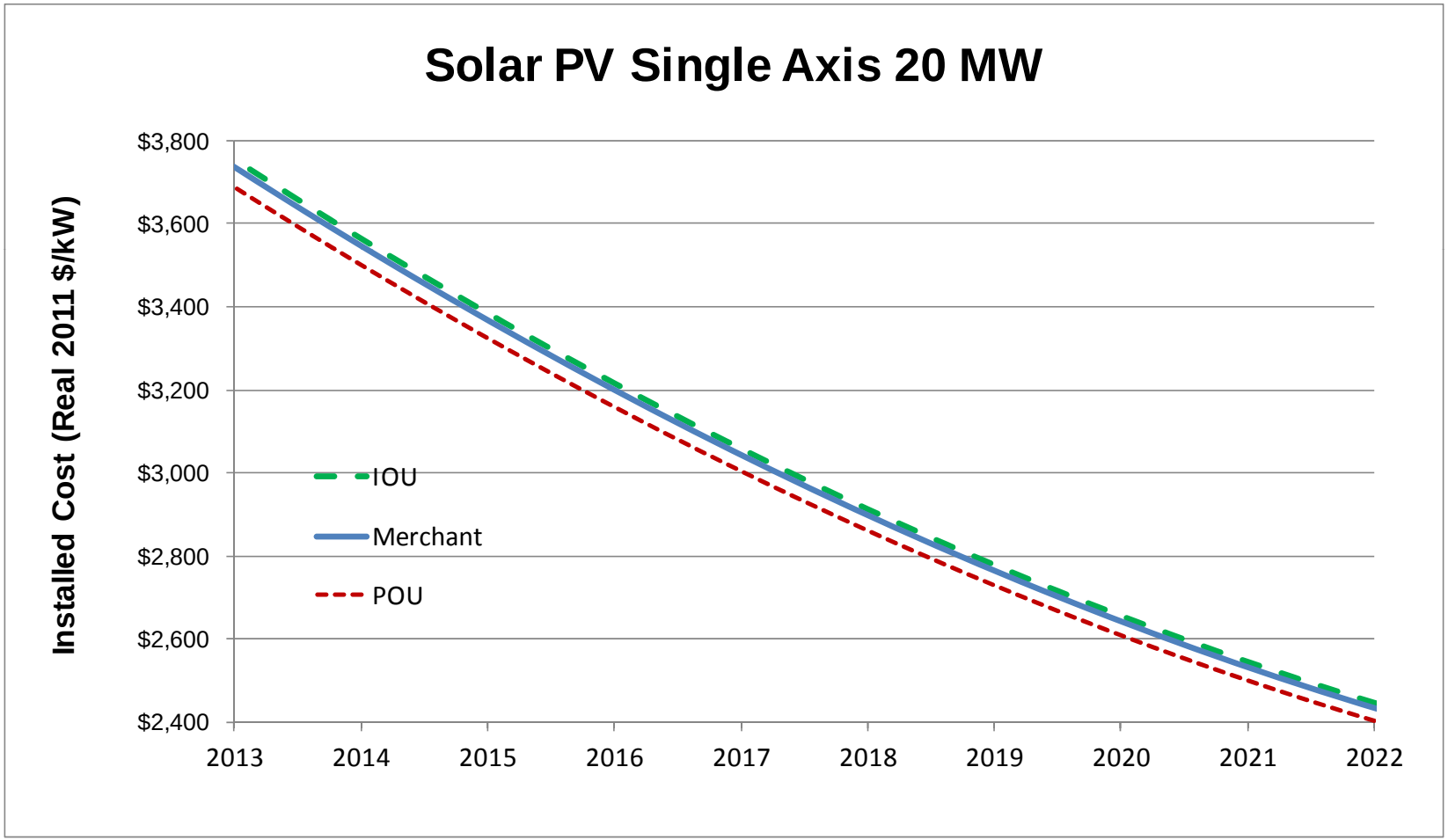


Mid-Cost Installed Costs by Developer



Mid-Cost Installed Costs by Developer



Summary 2013 LCOEs
Mid Cost Case

In-Service Year = 2013 (Nominal$)	Size	Merchant			IOU			POU		
	MW	$/kW-Yr	$/MWh	¢/kWh	$/kW-Yr	$/MWh	¢/kWh	$/kW-Yr	$/MWh	¢/kWh
Generation Turbine 49.9 MW	49.9	351.10	867.94	86.79	237.89	2939.74	293.97	230.29	379.88	37.99
Generation Turbine 100 MW	100	343.43	863.98	86.40	231.95	2916.95	291.70	226.47	380.20	38.02
Generation Turbine - Advanced 200 MW	200	291.06	463.34	46.33	184.63	1469.25	146.93	225.57	239.63	23.96
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	663.53	135.69	13.57	564.60	115.33	11.53	589.10	121.02	12.10
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	664.76	135.94	13.59	565.48	115.51	11.55	589.60	121.13	12.11
Biomass Fludized Bed Boiler 50 MW	50	885.74	134.92	13.49	1076.63	164.03	16.40	1002.63	153.12	15.31
Geothermal Binary 30 MW	30	691.90	116.54	11.65	932.52	157.20	15.72	739.49	126.14	12.61
Geothermal Flash 30 MW	30	793.73	142.56	14.26	1044.25	187.70	18.77	851.51	154.88	15.49
Solar Parabolic Trough W/O Storage 250 MW	250	360.29	187.38	18.74	512.99	266.90	26.69	397.04	209.03	20.90
Solar Parabolic Trough With Storage 250 MW	250	458.61	146.99	14.70	705.42	226.18	22.62	539.48	175.03	17.50
Solar Power TowerW/O Storage 100 MW	100	379.83	180.51	18.05	546.02	259.59	25.96	419.35	201.74	20.17
Solar Power Tower With Storage 100 MW 6 HRs	100	466.83	171.94	17.19	729.89	268.94	26.89	549.48	204.87	20.49
Solar Power Tower With Storage 100 MW 11 HRs	100	532.82	140.98	14.10	825.44	218.49	21.85	629.22	168.53	16.85
Solar Photovoltaic (Thin Film) 100 MW	100	215.06	156.50	15.65	338.19	246.27	24.63	257.90	192.04	19.20
Solar Photovoltaic (Single Axis) 100 MW	100	237.97	136.09	13.61	358.70	205.23	20.52	282.79	163.91	16.39
Solar Photovoltaic (Thin Film) 20 MW	20	249.31	186.71	18.67	401.64	301.02	30.10	299.56	229.58	22.96
Solar Photovoltaic (Single Axis) 20 MW	20	274.44	161.53	16.15	425.53	250.57	25.06	326.67	194.87	19.49
Wind - Class 3 100 MW	100	280.67	102.13	10.21	369.12	134.24	13.42	326.87	119.73	11.97
Wind - Class 4 100 MW	100	248.69	97.45	9.74	332.24	130.12	13.01	297.31	117.27	11.73

Merchant 2013 LCOEs
Mid-Cost Case

		$/MWh (Nominal 2013$)												¢/kWh
In-Service Year=2013	**Size MW**	Capital & Financing	Insurance	Ad Valorem	Fixed O&M	Taxes	**Fixed Costs**	Fuel	Variable O&M	**Variable Cost**	**Total Levelized Cost w/o Transmission**	Trans.	**Total Levelized Cost w/Transmission**	**Total Levelized Cost**
Generation Turbine 49.9 MW	49.9	460.65	31.54	45.73	87.78	133.68	**759.4**	81.34	0.00	**81.34**	**840.72**	27.22	**867.94**	**86.79**
Generation Turbine 100 MW	100	457.21	31.30	45.39	86.34	132.72	**753.0**	83.17	0.00	**83.17**	**836.14**	27.84	**863.98**	**86.40**
Generation Turbine - Advanced 200 MW	200	214.67	14.71	21.32	50.26	62.27	**363.2**	73.69	0.00	**73.69**	**436.92**	26.42	**463.34**	**46.33**
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	30.68	2.07	3.00	8.84	10.13	**54.7**	54.38	0.81	**55.19**	**109.92**	25.77	**135.69**	**13.57**
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	30.85	2.08	3.02	8.84	10.18	**55.0**	54.38	0.81	**55.19**	**110.17**	25.77	**135.94**	**13.59**
Biomass Fludized Bed Boiler 50 MW	50	67.41	6.25	9.23	19.98	-29.15	**73.7**	28.26	7.24	**35.51**	**109.23**	25.70	**134.92**	**13.49**
Geothermal Binary 30 MW	30	87.98	8.21	12.11	18.67	-38.57	**88.4**	0.00	0.00	**0.00**	**88.41**	28.14	**116.54**	**11.65**
Geothermal Flash 30 MW	30	102.78	9.59	14.15	19.91	-45.02	**101.4**	11.14	0.00	**11.14**	**112.56**	30.00	**142.56**	**14.26**
Solar Parabolic Trough W/O Storage 250 MW	250	168.37	8.06	13.05	45.64	-74.47	**160.6**	0.00	0.00	**0.00**	**160.65**	26.73	**187.38**	**18.74**
Solar Parabolic Trough With Storage 250 MW	250	148.82	7.13	2.10	28.12	-65.91	**120.3**	0.00	0.00	**0.00**	**120.26**	26.73	**146.99**	**14.70**
Solar Power TowerW/O Storage 100 MW	100	168.13	8.04	13.02	36.92	-74.17	**151.9**	0.00	0.00	**0.00**	**151.94**	28.57	**180.51**	**18.05**
Solar Power Tower With Storage 100 MW 6 HRs	100	182.68	8.75	2.57	30.18	-80.80	**143.4**	0.00	0.00	**0.00**	**143.37**	28.57	**171.94**	**17.19**
Solar Power Tower With Storage 100 MW 11 HRs	100	146.07	6.99	2.06	21.68	-64.56	**112.2**	0.00	0.00	**0.00**	**112.24**	28.74	**140.98**	**14.10**
Solar Photovoltaic (Thin Film) 100 MW	100	166.76	8.03	2.36	25.69	-74.80	**128.0**	0.00	0.00	**0.00**	**128.05**	28.45	**156.50**	**15.65**
Solar Photovoltaic (Single Axis) 100 MW	100	130.71	6.27	1.84	26.17	-58.03	**107.0**	0.00	0.00	**0.00**	**106.96**	29.13	**136.09**	**13.61**
Solar Photovoltaic (Thin Film) 20 MW	20	213.12	10.25	3.02	26.44	-95.40	**157.4**	0.00	0.00	**0.00**	**157.43**	29.28	**186.71**	**18.67**
Solar Photovoltaic (Single Axis) 20 MW	20	169.01	8.10	2.38	26.94	-74.87	**131.6**	0.00	0.00	**0.00**	**131.6**	29.98	**161.53**	**16.15**
Wind - Class 3 100 MW	100	60.27	5.76	8.41	14.35	-30.92	**57.9**	0.00	13.61	**13.61**	**71.5**	30.65	**102.13**	**10.21**
Wind - Class 4 100 MW	100	55.43	5.36	7.84	15.45	-30.90	**53.2**	0.00	13.61	**13.61**	**66.8**	30.65	**97.45**	**9.74**

IOU 2013 LCOEs
Mid-Cost Case

		$/MWh (Nominal 2013$)												¢/kWh
In-Service Year=2013	**Size MW**	Capital & Financing	Insurance	Ad Valorem	Fixed O&M	Taxes	**Fixed Costs**	Fuel	Variable O&M	**Variable Cost**	**Total Levelized Cost w/o Transmission**	Trans.	**Total Levelized Cost w/Transmission**	**Total Levelized Cost**
Generation Turbine 49.9 MW	49.9	1941.94	90.70	165.97	434.58	208.07	**2841.26**	72.40	0.00	**72.40**	**2913.66**	26.08	**2939.74**	**293.97**
Generation Turbine 100 MW	100	1927.43	90.02	164.73	427.43	206.63	**2816.25**	74.03	0.00	**74.03**	**2890.28**	26.67	**2916.95**	**291.70**
Generation Turbine - Advanced 200 MW	200	911.37	42.56	77.89	248.80	97.73	**1378.35**	65.59	0.00	**65.59**	**1443.94**	25.31	**1469.25**	**146.93**
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	25.72	1.20	2.20	8.75	3.60	**41.47**	48.36	0.80	**49.17**	**90.64**	24.69	**115.33**	**11.53**
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	25.86	1.21	2.21	8.75	3.62	**41.65**	48.36	0.80	**49.17**	**90.82**	24.69	**115.51**	**11.55**
Biomass Fludized Bed Boiler 50 MW	50	77.64	3.63	6.64	20.05	-5.25	**102.71**	27.95	7.27	**35.22**	**137.93**	26.10	**164.03**	**16.40**
Geothermal Binary 30 MW	30	103.18	4.82	8.82	18.75	-6.94	**128.63**	0.00	0.00	**0.00**	**128.63**	28.57	**157.20**	**15.72**
Geothermal Flash 30 MW	30	120.13	5.61	10.27	19.99	-8.08	**147.92**	9.32	0.00	**9.32**	**157.24**	30.46	**187.70**	**18.77**
Solar Parabolic Trough W/O Storage 250 MW	250	200.49	4.68	2.57	45.73	-13.51	**239.97**	0.00	0.00	**0.00**	**239.97**	26.93	**266.90**	**26.69**
Solar Parabolic Trough With Storage 250 MW	250	177.34	4.14	1.52	28.18	-11.92	**199.25**	0.00	0.00	**0.00**	**199.25**	26.93	**226.18**	**22.62**
Solar Power TowerW/O Storage 100 MW	100	200.04	4.67	2.56	37.00	-13.46	**230.81**	0.00	0.00	**0.00**	**230.81**	28.79	**259.59**	**25.96**
Solar Power Tower With Storage 100 MW 6 HRs	100	217.59	5.08	1.86	30.24	-14.62	**240.15**	0.00	0.00	**0.00**	**240.15**	28.79	**268.94**	**26.89**
Solar Power Tower With Storage 100 MW 11 HRs	100	173.95	4.06	1.49	21.72	-11.69	**189.54**	0.00	0.00	**0.00**	**189.54**	28.95	**218.49**	**21.85**
Solar Photovoltaic (Thin Film) 100 MW	100	198.88	4.64	1.70	25.75	-13.36	**217.61**	0.00	0.00	**0.00**	**217.61**	28.66	**246.27**	**24.63**
Solar Photovoltaic (Single Axis) 100 MW	100	155.14	3.62	1.33	26.23	-10.43	**175.88**	0.00	0.00	**0.00**	**175.88**	29.35	**205.23**	**20.52**
Solar Photovoltaic (Thin Film) 20 MW	20	253.97	5.93	2.17	26.50	-17.05	**271.52**	0.00	0.00	**0.00**	**271.52**	29.50	**301.02**	**30.10**
Solar Photovoltaic (Single Axis) 20 MW	20	200.45	4.68	1.71	26.99	-13.47	**220.37**	0.00	0.00	**0.00**	**220.37**	30.20	**250.57**	**25.06**
Wind - Class 3 100 MW	100	70.94	3.31	6.06	14.29	-4.09	**90.52**	0.00	13.56	**13.56**	**104.1**	30.2	**134.24**	**13.42**
Wind - Class 4 100 MW	100	66.10	3.09	5.65	15.39	-3.82	**86.40**	0.00	13.56	**13.56**	**100.0**	30.2	**130.12**	**13.01**

POU 2013 LCOEs
Mid-Cost Case

		$/MWh (Nominal 2013$)												¢/kWh
In-Service Year=2013	**Size MW**	Capital & Financing	Insurance	Ad Valorem	Fixed O&M	Credits & In-lieu	**Fixed Costs**	Fuel	Variable O&M	**Variable Cost**	**Total Levelized Cost w/o Transmission**	Trans.	**Total Levelized Cost w/Transmission**	**Total Levelized Cost**
Generation Turbine 49.9 MW	49.9	154.61	21.59	19.27	61.03	0.00	**256.50**	91.02	0.00	**91.02**	**347.53**	32.36	**379.88**	**37.99**
Generation Turbine 100 MW	100	153.45	21.43	19.12	60.03	0.00	**254.04**	93.07	0.00	**93.07**	**347.11**	33.09	**380.20**	**38.02**
Generation Turbine - Advanced 200 MW	200	71.84	10.03	8.95	34.94	0.00	**125.77**	82.46	0.00	**82.46**	**208.22**	31.40	**239.63**	**23.96**
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	15.21	2.12	1.90	9.25	0.00	**28.48**	61.08	0.84	**61.92**	**90.40**	30.62	**121.02**	**12.10**
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	15.29	2.14	1.91	9.25	0.00	**28.58**	61.08	0.84	**61.92**	**90.50**	30.62	**121.13**	**12.11**
Biomass Fludized Bed Boiler 50 MW	50	45.20	6.31	5.63	21.15	-0.70	**77.60**	35.50	7.65	**43.15**	**120.74**	32.37	**153.12**	**15.31**
Geothermal Binary 30 MW	30	56.67	7.91	7.06	19.96	-0.88	**90.73**	0.00	0.00	**0.00**	**90.73**	35.42	**126.14**	**12.61**
Geothermal Flash 30 MW	30	67.24	9.39	8.38	21.29	-1.04	**105.26**	11.86	0.00	**11.86**	**117.12**	37.76	**154.88**	**15.49**
Solar Parabolic Trough W/O Storage 250 MW	250	118.32	8.26	2.21	48.69	-1.83	**175.65**	0.00	0.00	**0.00**	**175.65**	33.38	**209.03**	**20.90**
Solar Parabolic Trough With Storage 250 MW	250	104.65	7.31	1.30	30.00	-1.62	**141.65**	0.00	0.00	**0.00**	**141.65**	33.38	**175.03**	**17.50**
Solar Power TowerW/O Storage 100 MW	100	118.05	8.24	2.21	39.38	-1.83	**166.06**	0.00	0.00	**0.00**	**166.06**	35.68	**201.74**	**20.17**
Solar Power Tower With Storage 100 MW 6 HRs	100	128.41	8.97	1.60	32.19	-1.99	**169.19**	0.00	0.00	**0.00**	**169.19**	35.68	**204.87**	**20.49**
Solar Power Tower With Storage 100 MW 11 HRs	100	102.65	7.17	1.28	23.13	-1.59	**132.64**	0.00	0.00	**0.00**	**132.64**	35.89	**168.53**	**16.85**
Solar Photovoltaic (Thin Film) 100 MW	100	120.78	8.43	1.51	27.70	-1.87	**156.55**	0.00	0.00	**0.00**	**156.55**	35.49	**192.04**	**19.20**
Solar Photovoltaic (Single Axis) 100 MW	100	93.34	6.52	1.16	27.95	-1.44	**127.54**	0.00	0.00	**0.00**	**127.54**	36.37	**163.91**	**16.39**
Solar Photovoltaic (Thin Film) 20 MW	20	154.23	10.77	1.92	28.51	-2.39	**193.06**	0.00	0.00	**0.00**	**193.06**	36.53	**229.58**	**22.96**
Solar Photovoltaic (Single Axis) 20 MW	20	120.61	8.42	1.50	28.77	-1.87	**157.44**	0.00	0.00	**0.00**	**157.44**	37.44	**194.87**	**19.49**
Wind - Class 3 100 MW	100	42.38	5.92	5.28	15.14	-0.66	**68.06**	0.00	14.26	**14.26**	**82.33**	37.3995	**119.73**	**11.97**
Wind - Class 4 100 MW	100	39.48	5.51	4.92	16.31	-0.61	**65.61**	0.00	14.26	**14.26**	**79.87**	37.3995	**117.27**	**11.73**

Summary 2022 LCOEs
Mid Cost Case

In-Service Year = 2022 (Nominal$)	Size	Merchant			IOU			POU		
	MW	$/kW-Yr	$/MWh	¢/kWh	$/kW-Yr	$/MWh	¢/kWh	$/kW-Yr	$/MWh	¢/kWh
Generation Turbine 49.9 MW	49.9	462.96	1144.46	114.45	309.69	3826.94	382.69	311.59	514.00	51.40
Generation Turbine 100 MW	100	454.26	1142.79	114.28	302.88	3808.93	380.89	307.30	515.89	51.59
Generation Turbine - Advanced 200 MW	200	377.75	601.35	60.13	233.34	1856.88	185.69	308.44	327.66	32.77
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	951.58	194.59	19.46	837.36	171.05	17.10	876.59	180.09	18.01
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	956.31	195.56	19.56	840.73	171.74	17.17	878.53	180.49	18.05
Biomass Fludized Bed Boiler 50 MW	50	1545.86	235.48	23.55	1495.56	227.85	22.79	1345.55	205.49	20.55
Geothermal Binary 30 MW	30	1340.00	225.99	22.60	1331.33	224.43	22.44	1068.48	182.26	18.23
Geothermal Flash 30 MW	30	1506.80	270.96	27.10	1491.86	268.16	26.82	1210.72	220.21	22.02
Solar Parabolic Trough W/O Storage 250 MW	250	579.61	301.81	30.18	577.43	300.42	30.04	450.33	237.08	23.71
Solar Parabolic Trough With Storage 250 MW	250	786.14	252.28	25.23	807.63	258.95	25.90	628.23	203.83	20.38
Solar Power TowerW/O Storage 100 MW	100	608.54	289.56	28.96	605.19	287.73	28.77	466.59	224.47	22.45
Solar Power Tower With Storage 100 MW 6 HRs	100	802.24	295.84	29.58	825.24	304.07	30.41	627.58	233.99	23.40
Solar Power Tower With Storage 100 MW 11 HRs	100	952.91	252.44	25.24	978.44	258.98	25.90	759.59	203.45	20.34
Solar Photovoltaic (Thin Film) 100 MW	100	335.71	244.85	24.49	346.55	252.36	25.24	277.13	206.36	20.64
Solar Photovoltaic (Single Axis) 100 MW	100	348.47	199.56	19.96	355.39	203.33	20.33	305.16	176.88	17.69
Solar Photovoltaic (Thin Film) 20 MW	20	417.82	313.64	31.36	432.78	324.36	32.44	328.40	251.68	25.17
Solar Photovoltaic (Single Axis) 20 MW	20	431.42	254.28	25.43	441.57	260.01	26.00	356.40	212.61	21.26
Wind - Class 3 100 MW	100	535.07	194.55	19.45	522.08	189.87	18.99	475.08	174.01	17.40
Wind - Class 4 100 MW	100	483.10	189.16	18.92	472.11	184.90	18.49	434.49	171.39	17.14

Merchant 2022 LCOEs
Mid-Cost Case

		$/MWh (Nominal 2022$)												¢/kWh
In-Service Year = 2022	**Size MW**	Capital & Financing	Insurance	Ad Valorem	Fixed O&M	Taxes	**Fixed Costs**	Fuel	Variable O&M	**Variable Cost**	**Total Levelized Cost w/o Transmission**	Trans.	**Total Levelized Cost w/Transmission**	**Total Levelized Cost**
Generation Turbine 49.9 MW	49.9	602.50	41.03	59.85	106.04	174.73	**984.2**	102.36	0.00	**102.36**	**1086.51**	57.95	**1144.46**	**114.45**
Generation Turbine 100 MW	100	600.04	40.86	59.61	104.30	174.07	**978.9**	104.66	0.00	**104.66**	**1083.53**	59.26	**1142.79**	**114.28**
Generation Turbine - Advanced 200 MW	200	268.75	18.31	26.71	60.71	77.89	**452.4**	92.72	0.00	**92.72**	**545.10**	56.25	**601.35**	**60.13**
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	39.89	2.68	3.91	10.68	13.16	**70.3**	68.43	0.98	**69.41**	**139.73**	54.86	**194.59**	**19.46**
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	40.54	2.72	3.97	10.68	13.38	**71.3**	68.43	0.98	**69.41**	**140.70**	54.86	**195.56**	**19.56**
Combined Cycle - Efficient (H Frame) 800 MW	800	29.37	1.97	2.88	8.08	9.69	**52.0**	65.00	0.98	**65.97**	**117.96**	54.63	**172.60**	**17.26**
Biomass Fludized Bed Boiler 50 MW	50	100.23	7.66	11.36	24.15	0.76	**144.2**	27.84	8.75	**36.60**	**180.75**	54.73	**235.48**	**23.55**
Geothermal Binary 30 MW	30	118.79	9.54	14.05	22.71	-0.45	**164.6**	0.00	0.00	**0.00**	**164.64**	61.35	**225.99**	**22.60**
Geothermal Flash 30 MW	30	140.47	11.28	16.61	24.21	-0.50	**192.1**	13.47	0.00	**13.47**	**205.55**	65.41	**270.96**	**27.10**
Solar Parabolic Trough W/O Storage 250 MW	250	177.37	7.30	11.80	47.22	-0.16	**243.5**	0.00	0.00	**0.00**	**243.53**	58.28	**301.81**	**30.18**
Solar Parabolic Trough With Storage 250 MW	250	156.70	6.45	1.90	29.10	-0.15	**194.0**	0.00	0.00	**0.00**	**194.00**	58.28	**252.28**	**25.23**
Solar Power TowerW/O Storage 100 MW	100	177.18	7.28	11.77	30.96	0.08	**227.3**	0.00	0.00	**0.00**	**227.27**	62.30	**289.56**	**28.96**
Solar Power Tower With Storage 100 MW 6 HRs	100	192.32	7.91	2.33	31.11	-0.12	**233.5**	0.00	0.00	**0.00**	**233.55**	62.30	**295.84**	**29.58**
Solar Power Tower With Storage 100 MW 11 HRs	100	159.02	6.54	1.92	22.35	-0.05	**189.8**	0.00	0.00	**0.00**	**189.78**	62.65	**252.44**	**25.24**
Solar Photovoltaic (Thin Film) 100 MW	100	144.91	6.02	1.77	31.28	-1.15	**182.8**	0.00	0.00	**0.00**	**182.82**	62.03	**244.85**	**24.49**
Solar Photovoltaic (Single Axis) 100 MW	100	99.28	4.10	1.21	31.83	-0.37	**136.0**	0.00	0.00	**0.00**	**136.05**	63.51	**199.56**	**19.96**
Solar Photovoltaic (Thin Film) 20 MW	20	207.86	8.62	2.54	32.19	-1.40	**249.8**	0.00	0.00	**0.00**	**249.80**	63.84	**313.64**	**31.36**
Solar Photovoltaic (Single Axis) 20 MW	20	148.55	6.12	1.80	32.76	-0.33	**188.9**	0.00	0.00	**0.00**	**188.9**	65.36	**254.28**	**25.43**
Wind - Class 3 100 MW	100	80.21	6.28	9.29	17.23	1.42	**114.4**	0.00	16.36	**16.36**	**130.8**	63.75	**194.55**	**19.45**
Wind - Class 4 100 MW	100	74.70	5.85	8.66	18.56	1.29	**109.1**	0.00	16.36	**16.36**	**125.4**	63.75	**189.16**	**18.92**

IOU 2022 LCOEs
Mid-Cost Case

		$/MWh (Nominal 2022$)												¢/kWh
In-Service Year = 2022	**Size MW**	Capital & Financing	Insurance	Ad Valorem	Fixed O&M	Taxes	**Fixed Costs**	Fuel	Variable O&M	**Variable Cost**	**Total Levelized Cost w/o Transmission**	Trans.	**Total Levelized Cost w/Transmission**	**Total Levelized Cost**
Generation Turbine 49.9 MW	49.9	2541.58	118.70	217.22	525.10	272.46	**3675.06**	96.35	0.00	**96.35**	**3771.40**	55.54	**3826.94**	**382.69**
Generation Turbine 100 MW	100	2531.13	118.21	216.33	516.47	271.49	**3653.63**	98.51	0.00	**98.51**	**3752.15**	56.79	**3808.93**	**380.89**
Generation Turbine - Advanced 200 MW	200	1141.73	53.32	97.58	300.62	122.46	**1715.70**	87.28	0.00	**87.28**	**1802.98**	53.90	**1856.88**	**185.69**
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	33.46	1.56	2.86	10.57	4.69	**53.14**	64.36	0.97	**65.33**	**118.47**	52.58	**171.05**	**17.10**
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	34.00	1.59	2.91	10.57	4.76	**53.83**	64.36	0.97	**65.33**	**119.16**	52.58	**171.74**	**17.17**
Combined Cycle - Efficient (H Frame) 800 MW	800	24.64	1.15	2.11	8.00	3.45	**39.35**	61.13	0.97	**62.09**	**101.44**	52.36	**153.80**	**15.38**
Biomass Fludized Bed Boiler 50 MW	50	95.58	4.46	8.17	24.23	3.32	**135.76**	27.74	8.78	**36.52**	**172.28**	55.57	**227.85**	**22.79**
Geothermal Binary 30 MW	30	119.90	5.60	10.25	22.66	5.17	**163.58**	0.00	0.00	**0.00**	**163.58**	60.85	**224.43**	**22.44**
Geothermal Flash 30 MW	30	141.29	6.60	12.08	24.16	6.10	**190.22**	13.06	0.00	**13.06**	**203.28**	64.88	**268.16**	**26.82**
Solar Parabolic Trough W/O Storage 250 MW	250	181.67	4.24	2.33	47.02	7.81	**243.07**	0.00	0.00	**0.00**	**243.07**	57.35	**300.42**	**30.04**
Solar Parabolic Trough With Storage 250 MW	250	160.58	3.75	1.37	28.97	6.93	**201.60**	0.00	0.00	**0.00**	**201.60**	57.35	**258.95**	**25.90**
Solar Power TowerW/O Storage 100 MW	100	181.22	4.23	2.32	30.82	7.82	**226.42**	0.00	0.00	**0.00**	**226.42**	61.31	**287.73**	**28.77**
Solar Power Tower With Storage 100 MW 6 HRs	100	197.00	4.60	1.68	30.97	8.51	**242.76**	0.00	0.00	**0.00**	**242.76**	61.31	**304.07**	**30.41**
Solar Power Tower With Storage 100 MW 11 HRs	100	162.84	3.80	1.39	22.25	7.04	**197.32**	0.00	0.00	**0.00**	**197.32**	61.66	**258.98**	**25.90**
Solar Photovoltaic (Thin Film) 100 MW	100	149.02	3.48	1.27	31.12	6.42	**191.31**	0.00	0.00	**0.00**	**191.31**	61.05	**252.36**	**25.24**
Solar Photovoltaic (Single Axis) 100 MW	100	101.55	2.37	0.87	31.69	4.36	**140.83**	0.00	0.00	**0.00**	**140.83**	62.50	**203.33**	**20.33**
Solar Photovoltaic (Thin Film) 20 MW	20	213.46	4.98	1.82	32.03	9.23	**261.52**	0.00	0.00	**0.00**	**261.52**	62.84	**324.36**	**32.44**
Solar Photovoltaic (Single Axis) 20 MW	20	151.69	3.54	1.30	32.62	6.54	**195.69**	0.00	0.00	**0.00**	**195.69**	64.33	**260.01**	**26.00**
Wind - Class 3 100 MW	100	78.17	3.65	6.68	17.27	3.48	**109.25**	0.00	16.39	**16.39**	**125.64**	64.22	**189.87**	**18.99**
Wind - Class 4 100 MW	100	72.83	3.40	6.22	18.59	3.24	**104.29**	0.00	16.39	**16.39**	**120.68**	64.22	**184.90**	**18.49**

POU 2022 LCOEs
Mid-Cost Case

		$/MWh (Nominal 2022$)												¢/kWh
In-Service Year = 2022	**Size MW**	Capital & Financing	Insurance	Ad Valorem	Fixed O&M	Credits & In-lieu	**Fixed Costs**	Fuel	Variable O&M	**Variable Cost**	**Total Levelized Cost w/o Transmission**	Trans.	**Total Levelized Cost w/Transmission**	**Total Levelized Cost**
Generation Turbine 49.9 MW	49.9	202.33	28.06	25.22	73.65	0.00	**329.25**	115.94	0.00	**115.94**	**445.19**	68.81	**514.00**	**51.40**
Generation Turbine 100 MW	100	201.49	27.94	25.11	72.44	0.00	**326.99**	118.55	0.00	**118.55**	**445.54**	70.36	**515.89**	**51.59**
Generation Turbine - Advanced 200 MW	200	89.99	12.48	11.22	42.16	0.00	**155.85**	105.03	0.00	**105.03**	**260.88**	66.78	**327.66**	**32.77**
Combined Cycle - 2 CTs No Duct Firing 500 MW	500	19.77	2.74	2.46	11.17	0.00	**36.14**	77.80	1.02	**78.82**	**114.96**	65.13	**180.09**	**18.01**
Combined Cycle - 2 CTs With Duct Firing 550 MW	550	20.09	2.79	2.50	11.17	0.00	**36.54**	77.80	1.02	**78.82**	**115.36**	65.13	**180.49**	**18.05**
Combined Cycle - Efficient (H Frame) 800 MW	800	14.56	2.02	1.81	8.45	0.00	**26.85**	73.89	1.01	**74.91**	**101.75**	64.86	**166.61**	**16.66**
Biomass Fludized Bed Boiler 50 MW	50	55.63	7.72	6.93	25.52	0.00	**95.80**	31.61	9.23	**40.84**	**136.64**	68.84	**205.49**	**20.55**
Geothermal Binary 30 MW	30	65.85	9.13	8.21	24.09	-0.34	**106.94**	0.00	0.00	**0.00**	**106.94**	75.33	**182.26**	**18.23**
Geothermal Flash 30 MW	30	79.08	10.97	9.86	25.69	-0.41	**125.18**	14.72	0.00	**14.72**	**139.89**	80.32	**220.21**	**22.02**
Solar Parabolic Trough W/O Storage 250 MW	250	107.21	7.43	2.00	49.98	-0.55	**166.08**	0.00	0.00	**0.00**	**166.08**	71.00	**237.08**	**23.71**
Solar Parabolic Trough With Storage 250 MW	250	94.76	6.57	1.18	30.80	-0.49	**132.83**	0.00	0.00	**0.00**	**132.83**	71.00	**203.83**	**20.38**
Solar Power TowerW/O Storage 100 MW	100	106.95	7.42	2.00	32.77	-0.55	**148.58**	0.00	0.00	**0.00**	**148.58**	75.90	**224.47**	**22.45**
Solar Power Tower With Storage 100 MW 6 HRs	100	116.26	8.06	1.45	32.93	-0.60	**158.09**	0.00	0.00	**0.00**	**158.09**	75.90	**233.99**	**23.40**
Solar Power Tower With Storage 100 MW 11 HRs	100	96.10	6.66	1.20	23.65	-0.50	**127.12**	0.00	0.00	**0.00**	**127.12**	76.33	**203.45**	**20.34**
Solar Photovoltaic (Thin Film) 100 MW	100	90.50	6.28	1.13	33.43	-0.47	**130.87**	0.00	0.00	**0.00**	**130.87**	75.50	**206.36**	**20.64**
Solar Photovoltaic (Single Axis) 100 MW	100	61.10	4.24	0.76	33.73	-0.31	**99.51**	0.00	0.00	**0.00**	**99.51**	77.37	**176.88**	**17.69**
Solar Photovoltaic (Thin Film) 20 MW	20	129.64	8.99	1.62	34.41	-0.67	**173.98**	0.00	0.00	**0.00**	**173.98**	77.70	**251.68**	**25.17**
Solar Photovoltaic (Single Axis) 20 MW	20	91.27	6.33	1.14	34.72	-0.47	**132.99**	0.00	0.00	**0.00**	**132.99**	79.63	**212.61**	**21.26**
Wind - Class 3 100 MW	100	46.69	6.48	5.82	18.27	0.00	**77.26**	0.00	17.21	**17.21**	**94.47**	79.54	**174.01**	**17.40**
Wind - Class 4 100 MW	100	43.50	6.03	5.42	19.68	0.00	**74.63**	0.00	17.21	**17.21**	**91.85**	79.54	**171.39**	**17.14**