

MEMO

Date: Wednesday, September 17, 2014
To: Adam Klinger, EPA
From: Jesse Geiger
Subject: Photovoltaic Feasibility Study for Brisbane

SUMMARY

This memo is a response to a request to update Brisbane Photovoltaic PV feasibility study results with the latest PV price data and models. Recent price drops show a greater than 20% decrease in prices for large scale PV systems. The results indicate that the Developer's Option has become more commercially attractive; however, the margin between the Developer's Option and the Renewable Energy Alternative (REA) is close enough that further study could change favorability with further definition of system sizing and placement.

RESULTS

The results of the modelling can be found in Table 1. The model shows that the site is economically attractive for a PV system under reasonable assumptions. The new modelled PV system prices are:

- \$2.50/Watt for ground mounted fixed axis systems
- \$3.00/Watt for ground mounted 1-axis systems
- \$2.25/Watt for roof mounted fixed axis systems.

These prices better reflect the economics of scale for larger, utility-scale systems (>5MW).

The net present value (NPV) for the Developer's Option Fixed Axis system is \$9,362,774 while the REA Fixed Axis system is \$7,945,885. The 1-Axis system has a greater difference in NPV, with the Developer's Option at \$9,792,459 and the REA at \$8,303,756. The difference in NPV between these two options is relatively small considering the overall scale of the system. The reason for the Developer's Option to be modelled as more attractive is due to the lower cost of roof installation. The lower cost is a result of not needing to ballast the roof systems. The Renewable Energy Alternative would become more economically viable if the size of the roof available for PV were less than what is modelled.

If a solar investor were to provide power to Brisbane, the investor would require between \$.086-.101/kWh produced by the system. This is competitive with PG&E utility prices.

Table 1: SAM Modelling Results

System Type	PV System Size ^a (kW)	Array Tilt (deg)	Annual Output (kWh/year)	Number of Houses
				Powered ^b
Renewable Energy Alternative Rooftop PV System	4,000	20	6,010,689	544
Renewable Energy Alternative Fixed-Axis Ground Mounted System	23,380	20	35,132,476	3182
Renewable Energy Alternative - Fixed-Axis Ground System	27,380	20	41,143,165	3727
Renewable Energy Alternative Rooftop PV System	4,000	20	6,010,689	544
Renewable Energy Alternative 1-Axis Ground Mounted System	19,281	20	36,820,200	3335
Renewable Energy Alternative - 1-Axis Ground System	23,281	20	42,830,889	3880
Developer Rooftop PV System	23,876	20	35,877,800	3250
Developer Fixed-Axis Ground Mounted System	4,303	20	6,465,998	586
Developer - Fixed-Axis Ground System	28,179	20	42,343,798	3835
Developer Rooftop PV System	23,876	20	35,877,800	3250
Developer 1-Axis Ground Mounted System	3,548	20	6,775,483	614
Developer - 1-Axis Ground System	27,424	20	42,653,283	3864

System Type	System Cost	Maximum Base		PPA Price (¢/kWh)	Net Present Value \$	Annual O&M (\$/year)	Payback
		Incentives	Incentives				Period with Incentives (years)
Renewable Energy Alternative Rooftop PV System	\$ 13,690,000	\$ 5,269,036	\$ 8.6	\$ 1,774,336	\$ 108,889	10.1	
Renewable Energy Alternative Fixed-Axis Ground Mounted System	\$ 61,622,500	\$ 24,726,985	\$ 10.4	\$ 6,171,549	\$ 636,453	11.1	
Renewable Energy Alternative - Fixed-Axis Ground System	\$ 75,312,500	\$ 29,996,021	\$ 10.1	\$ 7,945,885	\$ 745,342	10.9	
Renewable Energy Alternative Rooftop PV System	\$ 13,690,000	\$ 5,269,036	\$ 8.6	\$ 1,774,336	\$ 109,749	10.1	
Renewable Energy Alternative 1-Axis Ground Mounted System	\$ 60,985,150	\$ 24,727,625	\$ 9.4	\$ 6,529,420	\$ 529,019	10.8	
Renewable Energy Alternative - 1-Axis Ground System	\$ 74,675,150	\$ 29,996,661	\$ 9.3	\$ 8,303,756	\$ 638,768	10.7	
Developer Rooftop PV System	\$ 80,473,360	\$ 31,040,934	\$ 8.4	\$ 8,291,610	\$ 620,776	9.9	
Developer Fixed-Axis Ground Mounted System	\$ 14,708,080	\$ 5,661,916	\$ 10.5	\$ 1,071,164	\$ 111,878	11.3	
Developer - Fixed-Axis Ground System	\$ 95,181,440	\$ 36,702,850	\$ 8.7	\$ 9,362,774	\$ 732,654	10.1	
Developer Rooftop PV System	\$ 80,473,360	\$ 31,040,934	\$ 8.4	\$ 8,291,611	\$ 620,776	9.9	
Developer 1-Axis Ground Mounted System	\$ 14,555,536	\$ 5,650,262	\$ 9.6	\$ 1,500,848	\$ 92,248	10.2	
Developer - 1-Axis Ground System	\$ 95,028,896	\$ 36,691,196	\$ 8.6	\$ 9,792,459	\$ 713,024	10.0	

a Data assume a maximum usable area of 33 acres

Number of average American households that could hypothetically be powered by the PV system assuming 11,040

b kWh/year/household.

c Job-years created as a result of project capital investment including direct, indirect, and induced jobs.

d Jobs (direct, indirect, and induced) sustained as a result of operations and maintenance (O&M) of the system.