



MEMORANDUM

Public Utilities Department *Power Resources Division*

DATE: February 13, 2020

RE: Attachment 1: RPU/PWD Biogas Project - Economic Proforma Details

The following documentation describes and quantifies the information and assumptions used in the attached RPU / Public Works Department (PWD) Biogas economic assessment (Proforma).

1. Economic Assumptions

Given that this project represents a base-load energy generation asset with an expected 95% capacity factor, it is not necessary to simulate this asset within our Production Cost Modeling environment. Rather, a long-term economic assessment can be readily developed by comparing the primary 20-year expected value streams associated with the asset (i.e., local RA, PCC-1 RECs, and local value of injected energy at our MLAP-RVSD p-node) against the various costs incurred to operate the system (i.e., expected capacity or debt service payment, turbine warranty and O&M payment, biogas clean-up costs, and \$/MMBtu biogas payments to PWD).

RPU Value Proposition (expected Gross Market Revenue)

The gross market revenue generated by this project will primarily consist of three main components:

1. Value of Local Resource Adequacy (Local-RA) via avoidance of Local-RA costs
2. Implied value of Renewable Energy Credits (REC's)
3. Direct value obtained from the injection of generation energy into the MLAP_RVSD p-node

RPU Costs (to deploy and operate the Micro-turbine system)

The gross costs to deploy and operate this project can be attributed to four main development and/or operations and maintenance (O&M) components:

1. Annual contract capacity payment (or debt service payment)
2. Annual O&M payment to maintain the Micro-turbine performance characteristics for 20 years
3. Expected annual O&M cost to clean-up / pre-treat the raw biogas
4. Annual \$/MMBtu payment to Public Works for the treated biogas

2. Proforma Calculations

The attached Proforma quantifies the above revenue and cost components into a single spreadsheet that shows the overall value proposition to both RPU and the PWD over a 20-year time horizon (which represents the minimum operational life expectancy of this generation asset).

The expected gross market revenues are shown under the “RPU Value Proposition” section of the Proforma. The assumed \$/kW-month cost for Local-RA has been set to \$6.92/kW-month, which represents the price that RPU has already paid for a Local-RA product in 2021. The PCC-1 REC value is assumed to be \$20 in 2020, which corresponds to current industry forecasts. Likewise, the value used for baseload energy injected at the MLAP_RVSD p-node has been set to \$40.47/MWh, which corresponds to the observed average CAISO DA energy price at our p-node from January 1, 2018 through December 31, 2019.

The expected gross costs to deploy and operate the project are shown under the “RPU Costs” section of the Proforma. The engineering, design and construction of this project is currently expected to cost \$7,565,000. The debt service (or equivalent capacity) payment of \$556,646 represents the annual payment that RPU must make if this cost were to be financed over 20 years at a 4% interest rate. Likewise, the annual, 20-year non-escalating turbine O&M payment of \$266,409 represents the cost for fully insuring, maintaining and periodically overhauling the proposed configuration of Micro-turbines throughout the 20-year life of the project. The estimated annual biogas conditioning cost of \$154,327 represents our best current estimate of the annual costs to clean-up and pre-treat the raw biogas (note that this corresponds to an initial \$0.790/MMBtu unit cost to clean the gas). Finally, the annual, non-escalating biogas payment of \$273,491 (to the Public Works Department) quantifies the cost of purchasing the treated biogas, as determined by the RPU/PWD agreed to fee of \$1.40/MMBtu.

All three gross revenues and one gross cost are expected to increase over time, due to various inflationary pressures. Local-RA costs may increase significantly, particularly over the next 5-10 years, due to a critical shortfall of thermal capacity in the CAISO market. The energy price at our local p-node could also significantly increase, due primarily to LMP congestion costs in response to the over development of solar PV energy in the greater southern CA region. In contrast, the value of REC’s and the costs for the physical/chemical materials used to pre-treat the biogas are expected to increase more gradually over time. Nonetheless, the escalators on all revenue and cost components have been set to equivalent annual 3% estimates, in order to produce a more conservative set of forecasts.

Finally, the expected PWD revenues are shown under the “Public Works Value Stream” section of the Proforma. Note that these simply reflect the non-escalating biogas payment revenues received from RPU.

3. Summary of Proforma Calculations

As shown in the lower right-hand section of the Proforma, the total 20-year cost to build, deploy and operate this Micro-turbine project is estimated to be 26.08 M\$ (not including the additional 0.35 M\$ cost to interconnect to the RPU distribution system). Likewise, the total expected 20-year revenue stream is estimated to be 32.05 M\$, resulting in a net positive value of 5.62 M\$ over the life of the project. Finally, the Public Works Department is expected to receive about 5.47 M\$ in additional revenue for the sale of their raw biogas to RPU (to serve as fuel for the project).

Extra Notes: This project offers additional tangible benefits to RPU, PWD, and the City that are expected to be potentially material, but more difficult to currently quantify. These benefits include establishing a hedge against future CAISO energy cost increases at our local MLAP_RVSD p-node, achieving a meaningful increase towards the City's sustainable energy generation goals, and achieving a consistent and dependable 2 MW peak load reduction at the Vista interconnection point. Additionally, this project may qualify for potential future CEC grant funding opportunities (for novel biogas to power generation projects deployed by CA load serving entities).

Year	RPU Value Proposition							RPU Costs (to Build, Deploy and Operate System)								Public Works Value Stream			
	Local RA (\$/kW-month) [annual esc] 3.0%	PCC-1 RECs (\$/MWh) [annual esc] 3.0%	Local Pnode Energy Price (\$/MWh) [annual esc] 3.0%	Energy (MWh/year) [CF%] 95.0% [nameplate] 2.200 [parasitic load] 0.250	RA Value (\$/MWh) [conversion]	Total Value (\$/MWh)	Total Value (\$/year)	Debt Service (\$/year) [payment] \$556,646 [years] 20.0	Full 20-Year Turbine O&M (\$/year) [payment] \$266,409	GVOM: Gas Conditioning (\$/MMBtu) [annual esc] 3.0%	Annual GVOM Costs (\$/year)	BioGas Fee (\$/MMBtu) [annual esc] 0.0%	BioGas Payment (\$/year) [annual cost] (paid to PW)	Total Cost (\$/MWh)	Total Cost (\$/year)	BioGas Revenue (\$/year)	Gas Delivered to RPU (MMBtu/hour)	Total Value (\$/year)	
2018	\$6.33																		
2019	\$6.52		\$40.47																
2020	\$6.72	\$20.00	\$41.68																
2021	\$6.92	\$20.60	\$42.93	16,228	\$9.97	\$73.51	\$1,192,890	\$556,646	\$266,409	\$0.790	\$154,327	\$1.400	\$273,491	\$77.08	\$1,250,873	\$273,491	22.30	\$273,491	
2022	\$7.12	\$21.22	\$44.22	16,228	\$10.27	\$75.71	\$1,228,677	\$556,646	\$266,409	\$0.814	\$158,957	\$1.400	\$273,491	\$77.37	\$1,255,503	\$273,491	22.30	\$273,491	
2023	\$7.34	\$21.85	\$45.55	16,228	\$10.58	\$77.99	\$1,265,537	\$556,646	\$266,409	\$0.838	\$163,726	\$1.400	\$273,491	\$77.66	\$1,260,271	\$273,491	22.30	\$273,491	
2024	\$7.56	\$22.51	\$46.92	16,228	\$10.90	\$80.32	\$1,303,504	\$556,646	\$266,409	\$0.863	\$168,637	\$1.400	\$273,491	\$77.96	\$1,265,183	\$273,491	22.30	\$273,491	
2025	\$7.79	\$23.19	\$48.32	16,228	\$11.23	\$82.73	\$1,342,609	\$556,646	\$266,409	\$0.889	\$173,696	\$1.400	\$273,491	\$78.28	\$1,270,242	\$273,491	22.30	\$273,491	
2026	\$8.02	\$23.88	\$49.77	16,228	\$11.56	\$85.22	\$1,382,887	\$556,646	\$266,409	\$0.916	\$178,907	\$1.400	\$273,491	\$78.60	\$1,275,453	\$273,491	22.30	\$273,491	
2027	\$8.26	\$24.60	\$51.27	16,228	\$11.91	\$87.77	\$1,424,374	\$556,646	\$266,409	\$0.943	\$184,275	\$1.400	\$273,491	\$78.93	\$1,280,820	\$273,491	22.30	\$273,491	
2028	\$8.51	\$25.34	\$52.80	16,228	\$12.27	\$90.41	\$1,467,105	\$556,646	\$266,409	\$0.972	\$189,803	\$1.400	\$273,491	\$79.27	\$1,286,349	\$273,491	22.30	\$273,491	
2029	\$8.76	\$26.10	\$54.39	16,228	\$12.63	\$93.12	\$1,511,118	\$556,646	\$266,409	\$1.001	\$195,497	\$1.400	\$273,491	\$79.62	\$1,292,043	\$273,491	22.30	\$273,491	
2030	\$9.03	\$26.88	\$56.02	16,228	\$13.01	\$95.91	\$1,556,451	\$556,646	\$266,409	\$1.031	\$201,362	\$1.400	\$273,491	\$79.98	\$1,297,908	\$273,491	22.30	\$273,491	
2031	\$9.30	\$27.68	\$57.70	16,228	\$13.40	\$98.79	\$1,603,145	\$556,646	\$266,409	\$1.062	\$207,403	\$1.400	\$273,491	\$80.35	\$1,303,948	\$273,491	22.30	\$273,491	
2032	\$9.57	\$28.52	\$59.43	16,228	\$13.81	\$101.75	\$1,651,239	\$556,646	\$266,409	\$1.094	\$213,625	\$1.400	\$273,491	\$80.74	\$1,310,171	\$273,491	22.30	\$273,491	
2033	\$9.86	\$29.37	\$61.21	16,228	\$14.22	\$104.81	\$1,700,776	\$556,646	\$266,409	\$1.126	\$220,033	\$1.400	\$273,491	\$81.13	\$1,316,579	\$273,491	22.30	\$273,491	
2034	\$10.16	\$30.25	\$63.05	16,228	\$14.65	\$107.95	\$1,751,800	\$556,646	\$266,409	\$1.160	\$226,634	\$1.400	\$273,491	\$81.54	\$1,323,180	\$273,491	22.30	\$273,491	
2035	\$10.46	\$31.16	\$64.94	16,228	\$15.09	\$111.19	\$1,804,354	\$556,646	\$266,409	\$1.195	\$233,433	\$1.400	\$273,491	\$81.96	\$1,329,979	\$273,491	22.30	\$273,491	
2036	\$10.78	\$32.09	\$66.89	16,228	\$15.54	\$114.52	\$1,858,484	\$556,646	\$266,409	\$1.231	\$240,436	\$1.400	\$273,491	\$82.39	\$1,336,982	\$273,491	22.30	\$273,491	
2037	\$11.10	\$33.06	\$68.90	16,228	\$16.01	\$117.96	\$1,914,239	\$556,646	\$266,409	\$1.268	\$247,650	\$1.400	\$273,491	\$82.83	\$1,344,195	\$273,491	22.30	\$273,491	
2038	\$11.43	\$34.05	\$70.96	16,228	\$16.49	\$121.50	\$1,971,666	\$556,646	\$266,409	\$1.306	\$255,079	\$1.400	\$273,491	\$83.29	\$1,351,625	\$273,491	22.30	\$273,491	
2039	\$11.78	\$35.07	\$73.09	16,228	\$16.98	\$125.14	\$2,030,816	\$556,646	\$266,409	\$1.345	\$262,731	\$1.400	\$273,491	\$83.76	\$1,359,277	\$273,491	22.30	\$273,491	
2040	\$12.13	\$36.12	\$75.29	16,228	\$17.49	\$128.90	\$2,091,741	\$556,646	\$266,409	\$1.385	\$270,613	\$1.400	\$273,491	\$84.25	\$1,367,159	\$273,491	22.30	\$273,491	
Gross 20-Year Revenue:							\$32,053,412	Total 20-Year Project Cost:							\$26,077,742	Total 20-Year ROI:			22.9%
Total 20-Year Value:							\$5,625,670	RPU Interconnection Cost:							\$350,000	Total Value:			\$5,469,818