bobparkins
renewable energy consultants

19 April 2018, Revised 16 May 2018

Discovery Bay Waste Water Treatment Plant, Byron, CA

Initial Evaluation of Solar Energy Opportunities

Scope: Bob Parkins Renewable Energy Consultants was tasked to perform an initial evaluation of solar energy opportunities for the water treatment plant at Discovery Bay, near Byron, California. The purpose of the evaluation is to determine if solar is attractive economically considering the facility's electric loads and the utility rates.

Process:

1. As a first step, an Excel spreadsheet was developed (Sheet 1 of attachment) to summarize the plant's electric consumption or load and the corresponding utility rates. Based on the total load, two PV systems were sized to replace nearly 100% of the utility energy. This strategy requires changing the facility's rate status to Net Energy Metering, whereby excess generated solar energy is "banked" and credited to satisfy the electric load when the solar system is not generating, such as at night. This way all the generated solar energy is utilized to meet the facility's annual load. The two selected systems were: (1) a fixed ground mount facing due south with a 25-degree module tilt; and (2) a single-axis tracker, which moves to follow the sun.

    a. **Facility Electric Loads and Utility Rates:**

Season and Time of Use	Typical Electric Monthly Load in kWh	Energy Rate in $/kWh
Summer		
Peak	170,000 – 174,000	0.152
Partial Peak	35,000 – 38,000	0.111
Off-Peak	100,000 – 107,000	0.084
Winter		
Partial Peak	190,000 – 200,000	0.106
Off-Peak	106,000 – 122,000	0.091

b. **Observations:**

i. The month-to-month electric loads vary somewhat within a relatively narrow band, as would be expected for a continuously operating water treatment plant.

ii. The PG&E electric rate schedule is E19S, "Medium General Demand Metered Time of Use". Under this rate schedule, the plant has relatively low energy costs, measured in $/kWh, and large demand charges, measured in $/peak kW. The demand is the largest measured peak demand in kW over 15-minute periods during the billing period. Therefore, if there is a 30-day billing period, the highest demand during the 2,880 individual 15-minute intervals would be the basis for the demand charge. A typical demand charge for the plant is about 40% of the entire bill. Since a solar system only generates electricity when the sun shines and since the plant operates around the clock, the demand portion of the bills will likely not be reduced by solar. This rate structure is meant to reduce the impact of solar self-generation on utility revenues. Battery storage and load management are good strategies to reduce excessive demand charges.

c. **Selected System Sizes to Satisfy Approximately 100% of the Load:**

i. Fixed Tilt Ground Mount: 1,250kW or 1.25MW. This has a lower unit cost, but it takes up more land area because it is less efficient than a tracker.

ii. Single-Axis Tracker: 1,000kW or 1.00MW. This has a higher unit cost, but it takes up less land area because it is more efficient. Hence, it generates approximately the same amount of energy as a fixed tilt system using a smaller system size.

2. For the next step (see attachment, sheets 2 and 3), the two systems' performance were simulated for 20 years considering annual PV module degradation, operation and maintenance costs, historical utility rate escalation, local weather conditions, and standard solar system efficiencies and losses. This provided cash flows, from which simple payback periods and Returns on Investment (ROI) were calculated.

3. The spreadsheet also has several rows indicating incentives, other revenue sources, and Federal and State tax deductions and credits. None of these apply and are shown as $0 since this is a public and not a private project. This was done to highlight how private projects can justify solar more easily. It is a tougher exercise for public entities.

Results:

Case (Size)	Cost per Watt (Total Cost)	Simple Payback	ROI
1: Fixed Tilt Ground Mount, 1.25MW	$1.45 ($1,812,500)	7+ years	10.9%
2: Single-Axis Tracker, 1.0MW	$1.70 ($1,700,000)	7+ years	11.4%

Note: The "Costs per Watt" are based on current bids for similar-type projects.

Conclusion: With paybacks of 7+ years and Returns on Investment of about 11% for both projects, solar may be economically viable for the plant, depending on internal economic and performance goals.

Suggested Next Steps:

1. Assuming it is decided to implement solar, develop a Request for Proposal (RFP).
2. Advertise the RFP, evaluate the proposals, and select the winning Contractor.
3. Monitor the design and construction to assure the Contractor satisfies the objectives and requirements as well as Industry standards and appropriate codes.
4. Obtain Net Energy Metering classification and explore changing to a more advantageous rate structure with PG&E to maximize the savings.

Bob Parkins Renewable Energy Consultants is available to help implement the suggested next steps.

Respectfully Submitted.

Bob Parkins, PE
Bob Parkins Renewable Energy Consultants
www.bobparkinsconsultants.com
bparkins@comcast.net
bob@bobparkinsconsultants.com
916-806-6580 (cell)