CALIFORNIA BIOENERGY

Plugging dairies into a renewable future.

DATE: APRIL 30, 2013

TO: SHANNON O'ROURKE, CHERYL LEE (CPUC)

FROM: NEIL BLACK

CC: MERIDETH ALLEN, Redacted PG&E); ROSS BUCKENHAM (CALBIO)

RE: FOLLOW UP TO THE APRIL 25th MEETING

It was a pleasure to meet with you on Thursday. As a follow up to the meeting you requested supplemental information discussed in this memo.

1. Summary of Project Costs

Below is a breakdown of project costs. These numbers will change modestly as subcontractor bids are finalized and during construction.

Summary of Project Costs (4/29/13)

Construction/Equipment/Installation	$9,687,301	70%
Engineering/Project Management/Permitting	$1,642,317	12%
Financing Costs/Reserves	$1,022,619	7%
Professional Fees	$930,000	7%
Contigency	$434,000	3%
Sales-tax Related	$221,070	2%
	$13,937,307	100%

2. Impact of 1603 Grant

We estimate the required LCOE at approximately $220 per MWh without the 1603 grant funds. This corresponds to roughly a $60 per MWh or a 36% increase over the LCOE for Old River at $162.50.

	$/MWh	$/MWh (levelized)	IRR (20 YR)	IRR (15 YR)	Assumed CO2e $/Tonne	Debt-Equity Ratio	Energy Production
Grant	$130-135	$152-163	20.0%	17.5%	$20	75/25	Mid-level
No Grant	$162.5	$195	20.0%	17.5%	$20	75/25	Mid-level
No Grant	$185	$222	19.9%	17.7%	$20	50/50	Mid-level

Levelized assumptions: 75% of a 2.5% inflation rate and an 8% discount rate. IRRs are pre-tax

In the two runs above we assumed a mid -level energy production level at Old River (which corresponds closely to GEP) and a carbon price of $20 per ton.

In the $162.5 calculation, we also assumed a 75/25 debt to equity ratio. However, while Caterpillar is providing the project a 75% construction loan, as a result of the 1603 grant reimbursement, they are in actuality providing term debt of approximately 56% loan to value. Without the grant, we suspect Caterpillar would have required an approximate 50/50 debt to equity ratio, resulting in the $222 estimate in the chart. (For the analysis of the LCOE required without the 1603 grant, we used our combined Old River and Stockdale model, which is the basis for our equity analysis.)

2. Long-term Electricity Price Requirements

As discussed, dairy biogas in California is in its infancy. There are only 12 operating dairy digesters, and Stockdale is the first new project in over three years. Costs for a new industry are inherently higher and will come down with experience, lowering the needed electricity price. In addition, external factors, particularly the development of the carbon market, may have a significant impact.

(To be able to see the impact of a cost curve and external factors, we developed a model reflecting an independent dairy.)

A. Cost Curve Reductions

With experience, financing costs, capital expenditures, and O&M costs will come down. Reductions will follow project development experience and the formation of a local supply chain. We estimate the reductions taking place over the next five years, with learning already underway.

(1) Financing Cost Reductions

- Debt: with experience a 75/25 debt to equity ratio should become the norm.

  In addition, we assume it will be possible to lower the cost of the debt. With experience, project developers will have additional debt provider choices. Further, the California State Treasurer's Office has in place a program to finance dairy digester projects with municipal debt, which will further lower the cost of debt. (For developers to avail themselves of this program, they must secure a Letter of Credit from a commercial bank. This requires the same underwriting

process as securing commercial bank financing, which is unavailable on a non-secured basis for most projects at this early stage.)

- Equity: with experience (the reduction of risk) equity costs will be reduced. The impact of lowered equity costs will be more substantial than the reduction of the cost of debt.

- In summary, without 1603 we estimate a current Weighted Average Cost of Capital of approximately 13.5% with the potential reduction to 8.5% or lower (assuming generally consistent interest rates). The following are broad stroke estimates of the impact on the unlevelized electricity price from the reduction of capital costs – with electricity potentially falling from nearly $200 to $137.

		Equity Returns (20 Yr)				
		21.5%	20%	17.5%	15%	12.5%
Debt	7.0%	$195	$185	$166	$155	$140
	6.0%	$190	$180	$162	$150	$137

The above estimates an unlevelized cost/MWh at 75/25 D/E and $10 C

(2) Project Cost Reductions

Project costs will come down based on developer experience, scale and the development of a local supply chain. While we do not expect savings based on technology breakthroughs and mass scale as in the solar industry, we believe a 25% reduction in Capex and 10% reduction in O&M is reasonable to achieve over the long term. Below are estimates based on a 20% reduction in project costs (from approximately $8 per watt to $6.34 per watt).

	80% capex and 90% O&M				
20 Yr IRRs	21.5%	20%	17.5%	15%	12.5%
Full Cap Ex/O&M	$190	$180	$162	$150	$137
80% capex, 90% O&M (Unlevelized)	$152	$144	$130	$120	$109
80% capex, 90% O&M (LCOE)	$188	$188	$161	$148	$135

The above estimates the cost/MWh at 75/25 D/E and $10 C

(3) New Revenue Streams

There are potential new revenue opportunities for dairy digesters additionally driving down the LCOE. They will likely vary substantially from project to project and include:

- Bedding/Peat Moss. This will reflect the digester technology deployed and the bedding needs of a particular dairy.

- Fertilizer. Down the line there is the potential for dairies to develop a liquid fertilizer, which may prove valuable. Liquid effluent management may also create value by allowing dairies to increase herd size.

- Co-digestion. A minority of dairies will be able to co-digest additional substrates (based on regulatory review of their nutrient management plans and available fields for land application of the effluent). This will lead to potential tipping fees and a substantial increase in gas production and revenue. It is a future opportunity for some dairies (likely two to five years away).

- TOD incentives. In the model we are assuming a 75% capacity factor and the project receiving current TOD incentives. (This is also discussed below.)

B. External Factors

(1) Carbon Market (AB 32)

The development of a carbon market will have a significant impact on the development of dairy digesters.

We estimate over a $15 electricity price reduction per $10 of revenue per tonne of carbon credits. The impact could be as follows:

20 Yr IRRs	21.5%	20%	17.5%	15%	12.5%
Unlevelized ($10 C)	$152	$144	$130	$120	$109
Unlevelized ($20 C)	$135	$127	$112	$103	$91
LCOE ($20 C)	$162	$153	$135	$124	$109
Unlevelized ($30 C)	$119	$110	$95	$85	$74
LCOE ($30 C)	$143	$132	$114	$102	$89

The above estimates the cost/MWh at 75/25 D/E, 80% capex and 90% O&M
LCOE assumes 15 yr PPA, 75% of a 2.5% inflation rate, and 8% discount rate

(2) Government Incentives

The above estimates, with prices lowered potentially to $100 per MWh, exclude federal and state incentives other than AB 32. The extension of the ITC, and the ability to aggregate projects and bring in tax equity investors, will further drive down the LCOE. This is an important assumption to make for an apples-to-apples comparison to solar, since solar will currently assume ITC financing. A state program, such as EPIC, could also decrease the LCOE.

(3) Interconnection Costs

Interconnection costs can be a significant component of the project costs. This will vary greatly from dairy to dairy. It is important to look at ways to aggregate interconnection costs across clustered dairies (common in the Central Valley) to lower the cost per project. Also interconnection costs are estimated but not guaranteed, creating uncertainty and thereby increasing the cost of capital. Working with the utilities to provide greater certainty and aggregating projects will lower electricity costs. (We assumed roughly 7% of the project costs were related to the interconnection.)

(4) The Value of the Electricity

Dairy biogas projects can cost-effectively store energy. A lagoon provides an inexpensive mechanism to store biogas for 2 to 3 days. With the addition to the grid of significant capacity from solar projects, there is a current CAISO focus on energy sources for late in the afternoon and early evening. CalBio's objective is to manage a fleet of projects working closely with PG&E. Information technology is inexpensive and the ramp up to power generation is rapid. With intentionally over-built engine capacity (for instance a 33% capacity factor) the projects could run from 4 pm to midnight. They could also be adjusted and dispatched, changing per day-to-day PG&E needs. With our current pipeline we have the potential for 35 MW to nearly 50 MW with intentionally overbuilt capacity.

In summary, with the development of an industry, the LCOE can be reduced substantially and dairy biogas can provide a valuable renewable energy resource, cost competitively (potentially around $100 per MWh), while destroying methane, reducing odors, enhanced water protection, creating jobs, and adding to the farm economy.

Please let us know if you have any questions.