



Division of Ratepayer Advocates  
California Public Utilities Commission

## MEMORANDUM

Date : June 14, 2013

To : Adam Schultz, Energy Division Staff, [adam.schultz@cpuc.ca.gov](mailto:adam.schultz@cpuc.ca.gov)  
cc: Service List R.11-05-005

From : Division of Ratepayer Advocates, Electricity Planning and Policy Branch  
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Subject : Informal Follow-Up Comments of the Division of Ratepayer Advocates on Draft Study “Small-Scale Bioenergy: Resource Potential, Costs, and FiT Implementation Assessment”

On May 2, 2013, Energy Division staff held a workshop to review and seek informal input from parties on a draft consultant study titled, “Small-Scale Bioenergy: Resource Potential, Costs, and Feed-in Tariff Implementation Assessment” (Draft Study). As a follow-up to the workshop, Energy Division staff now offers the opportunity for parties to file additional informal comments on the issues below. The Division of Ratepayer Advocates (DRA) submits these Informal Follow-Up Comments on the Draft Study in accordance with the electronic mail received from Energy Division Staff, Adam Shultz, on May 10, 2013.

- (1) **Resource Potential.** *Several parties identified, both at the workshop and in pre-workshop written comments, alternative public sources of data (including potential constraints on resources) and/or alternative assumptions or methodologies that might better inform the consultant study’s quantification of the state’s potential of SB 1122-eligible resources. If you have identified such a source and/or alternative assumption or methodology, please provide:*
- a) *A description of the source, assumption, or methodology that explains how incorporation of that information would have a material impact on the resource potential already identified in the draft consultant study;*
  - b) *A citation to a public source of the data or justification for the alternative assumption or methodology, preferably including a direct website link or attaching a PDF; and,*

- c) *A justification, if providing alternative assumptions or methodologies, for why alternative approach or methodology to quantify resources is more appropriate than what has been utilized by the current draft consultant study.*

DRA has no further comments on the resource potential of SB 1122-eligible resources at this time, and urges the Commission to consider the issues raised in DRA's Informal Comments on Draft Study, dated April 24, 2013.

(2) **Cost Estimates.** *Several parties also identified, again both at the workshop and in pre-workshop written comments, alternative public estimates of the levelized cost of electricity (LCOE) of various SB 1122-eligible projects, or public sources of data that impact some component of the LCOE estimates (e.g., feedstock cost, transportation cost, etc.). If you have identified this type of data, please provide:*

- a) *A description of the information presented that explains how incorporation of the new information would have a material impact on the LCOE estimates already provided in the draft consultant study;*
- b) *A citation to a public source of the data, preferably including a direct website or attaching a PDF; and,*
- c) *An indication that the information provided reflects actual costs.*

### **Dairy Bioenergy**

- a) On April 24, 2013, DRA submitted Informal Comments on Draft Study in accordance with an electronic mail received from the Energy Division Staff, Adam Shultz, on April 9, 2013. DRA's comments emphasized the need to consider the additional revenue stream of greenhouse gas (GHG) offset revenue under the Assembly Bill (AB) 32 Cap-and-Trade program in estimates of the levelized cost of electricity (LCOE) of SB 1122-eligible dairy bioenergy projects. As detailed below, incorporation of the GHG offset revenue will have a material impact on the LCOE estimates provided in the draft report by significantly lowering the LCOE estimates for dairy biogas projects. Thus, DRA continues to recommend that the Commission consider the additional revenue stream of GHG offset revenue under the AB 32 Cap-and-Trade program and below expands on the information provided in DRA's April 24 Informal Comments on Draft Study.

The Draft Study acknowledges that dairy manure digesters are eligible for GHG offset credits under AB 32 and notes that GHG offset revenue improves the economics of dairy biogas projects. The Draft Study estimates that a \$20/Metric Ton (MT) carbon dioxide

equivalent (CO<sub>2</sub>e) offset value would produce GHG offset revenue of roughly \$500,000/year for a 5,500 cow dairy manure digester project, lowering the LCOE by \$70/MWh.<sup>1</sup> The Environmental Science Associates Report (ESA Report) cited below in Section 2.b. demonstrates that this estimate is on the low side. The productivity assumptions in the ESA Report show that with a \$20/MT CO<sub>2</sub>e offset value, a 5,500 cow dairy manure digester project could produce GHG offset revenue of roughly \$820,000/year, or approximately 60 percent greater than estimated in the Draft Study.<sup>2</sup> Additionally, the Draft Study chose not to include any GHG offset revenue in its estimates of LCOE for dairy biogas projects because of the uncertainty for offset prices, demand, and eligibility.<sup>3</sup> Attributing a value of zero to future GHG offset revenue is a shortcoming in the analysis and is inconsistent with the uncertainty of other future revenue streams and values. In Section 2.c. below, DRA discusses the uncertainties identified in the Draft Study regarding GHG offset revenue, and proposes ways to reasonably account for the uncertainties when incorporating the impact of GHG offset revenue in the LCOE estimates.

The ESA Report states that the magnitude of often speculative revenues (e.g. digester byproducts, tipping fees, and environmental attributes) will likely remain secondary to the value of the digester's primary product, which is biogas, with the one notable exception being the potential for implementation of AB 32 and/or a Federal cap-and-trade system to create a compliance market in which the carbon offsets from dairy digesters could create a major additional project revenue stream. The AB 32 Cap-and-Trade program is currently underway, with compliance obligations for the electricity sector and industrial sector in effect since January 1, 2013. The California Air Resources Board (CARB) offset protocol cited below in Section 2.b. verifies that dairy digester projects are eligible to generate offset credits under the Cap-and-Trade program.

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<sup>1</sup> Black and Veatch, Small Scale Bioenergy: Resource Potential, Costs, and Feed-in Tariff Implementation Assessment, April 9, 2013, p.4-3.

<sup>2</sup> Environmental Science Associates, Economic Feasibility of Dairy Manure Digester and Co-Digester Facilities in the Central Valley of California, May 2011, pp.2-4 to 2-7. Available at: [http://www.waterboards.ca.gov/centralvalley/water\\_issues/dairies/dairy\\_program\\_regs\\_requirements/final\\_dairy\\_di\\_gstr\\_econ\\_rpt.pdf](http://www.waterboards.ca.gov/centralvalley/water_issues/dairies/dairy_program_regs_requirements/final_dairy_di_gstr_econ_rpt.pdf)

<sup>3</sup> Black and Veatch, Small Scale Bioenergy: Resource Potential, Costs, and Feed-in Tariff Implementation Assessment, April 9, 2013, p.4-3.

The ESA Report provides production assumptions for an average dairy digester system operating in the Central Valley of California.<sup>4</sup> As shown below in Table 1, the ESA productivity assumptions result in a GHG offset revenue estimate that is over 60 percent higher than the Black and Veatch Draft Study estimate. Specifically, the ESA Report assumes that an average dairy digester system operating in the Central Valley can reduce CO<sub>2</sub>e by approximately 7,450 kg/CO<sub>2</sub>e per cow per year. This is equivalent to 7.450 MT/CO<sub>2</sub>e reductions per cow per year. Under the AB 32 Cap-and-Trade program, each compliance GHG offset credit is equivalent to 1 MT/CO<sub>2</sub>e, so multiplying the carbon reductions per cow by 5,500 cows (Draft Study assumption for dairy manure digestion cases) by the price of GHG offsets will result in the GHG offset revenues listed in Table 1. At a \$20/MT CO<sub>2</sub>e GHG offset price, DRA expects that this would lower the medium case LCOE estimate in the Draft Study by approximately \$105/MWh, or approximately 60 percent more than the Draft Study estimate of \$70/MWh.

**Table 1. Annual Estimated AB 32 GHG Offset Revenue for a 5,500 Cow Dairy Manure Digester Project**

|                                    | No Carbon Price | \$10/MT CO <sub>2</sub> e Price | \$20/MT CO <sub>2</sub> e Price | \$30/MT CO <sub>2</sub> e Price |
|------------------------------------|-----------------|---------------------------------|---------------------------------|---------------------------------|
| Black and Veatch Draft Study       | None            | Not provided                    | \$500,000                       | Not provided                    |
| ESA Study Productivity Assumptions | None            | \$409,750                       | \$819,500                       | \$1,229,250                     |

b) Citations:

Citation I: Environment Science Associates, Economic Feasibility of Dairy Manure Digester and Co-Digester Facilities in the Central Valley of California, May 2011. Available at: [http://www.waterboards.ca.gov/centralvalley/water\\_issues/dairies/dairy\\_program\\_regs\\_requirements/final\\_dairy\\_digstr\\_econ\\_rpt.pdf](http://www.waterboards.ca.gov/centralvalley/water_issues/dairies/dairy_program_regs_requirements/final_dairy_digstr_econ_rpt.pdf)

Citation II: California Air Resources Board, Livestock Projects Compliance Offset Protocol of the Cap-and-Trade Regulation. Available at: <http://www.arb.ca.gov/cc/capandtrade/protocols/livestock/livestock.htm>

<sup>4</sup> Environmental Science Associates, Economic Feasibility of Dairy Manure Digester and Co-Digester Facilities in the Central Valley of California, May 2011, pp.2-4 to 2-7. Available at: [http://www.waterboards.ca.gov/centralvalley/water\\_issues/dairies/dairy\\_program\\_regs\\_requirements/final\\_dairy\\_digstr\\_econ\\_rpt.pdf](http://www.waterboards.ca.gov/centralvalley/water_issues/dairies/dairy_program_regs_requirements/final_dairy_digstr_econ_rpt.pdf)

Citation III: Sanchez, Daniel, Dairy Biogas in California: Cost-Effective Development, April 2013. Available at: [http://rael.berkeley.edu/sites/default/files/Sanchez\\_Biogas\\_in\\_California\\_Masters\\_Draft\\_April\\_2013.pdf](http://rael.berkeley.edu/sites/default/files/Sanchez_Biogas_in_California_Masters_Draft_April_2013.pdf)

- c) The information provided above on the potential carbon reductions from dairy biogas projects represents actual productivity measures identified in the ESA Report for an average dairy digester system operating in the Central Valley. DRA assumes that the carbon reduction per cow scales linearly, so that a 5,500 cow dairy can reduce 40,975 MT/CO<sub>2</sub>e per year (5,500 cows \* 7.450 MT/CO<sub>2</sub>e per cow per year).

The information provided above on the potential GHG offset revenue from dairy biogas projects includes a range of projected GHG offset prices. DRA acknowledges that the information provided herein is not based on actual AB 32 compliance GHG offset prices because that nascent market has had limited activity and price discovery. However, there are various publicly available price points to ascertain a reasonable approximation or range of AB 32 GHG offset prices. For example, the ESA Report points to a rate of \$10.80 to \$11.00 per MT of CO<sub>2</sub>e reduction for dairy farm GHG reductions under PG&E's ClimateSmart™ program.<sup>5</sup> Additionally, the most recent CARB auction for California Cap-and-Trade compliance allowances cleared at \$14.00/MT CO<sub>2</sub>e.<sup>6</sup> For purposes of forecasting a GHG offset price under the AB 32 market, in order to calculate GHG offset revenue for dairy biogas projects, the Draft Study could employ a methodology that values GHG offsets at a discount to GHG allowances.<sup>7</sup> For instance, discounting GHG offsets by 25 percent as compared to market prices for GHG allowances would result in GHG offset values of \$10.50/MT CO<sub>2</sub>e at a GHG allowance price of \$14.00/MT CO<sub>2</sub>e. These price points can be input to a probabilistic model to establish a reasonable range of GHG offset prices. This

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<sup>5</sup> Environmental Science Associates, Economic Feasibility of Dairy Manure Digester and Co-Digester Facilities in the Central Valley of California, May 2011, p.1-20. Available at: [http://www.waterboards.ca.gov/centralvalley/water\\_issues/dairies/dairy\\_program\\_regs\\_requirements/final\\_dairy\\_digestion\\_econ\\_rpt.pdf](http://www.waterboards.ca.gov/centralvalley/water_issues/dairies/dairy_program_regs_requirements/final_dairy_digestion_econ_rpt.pdf)

<sup>6</sup> California Air Resources Board Quarterly Auction 3, May 2013 Summary Results Report June 5, 2013 Update. Available at: [http://www.arb.ca.gov/cc/capandtrade/auction/may-2013/updated\\_may\\_results.pdf](http://www.arb.ca.gov/cc/capandtrade/auction/may-2013/updated_may_results.pdf).

<sup>7</sup> It can be reasonably assumed that GHG offsets will be valued at a discount to GHG allowances, otherwise GHG offsets likely won't be pursued for compliance purposes.

model is capable of simulating revenues with uncertain input prices, and estimating the impact that GHG offset revenue will have on the economics of dairy biogas projects.<sup>8</sup>

DRA strongly opposes excluding GHG offset revenue in estimating the LCOE for dairy biogas projects. The Draft Study does not include any GHG offset revenue in its estimates of LCOE for dairy biogas projects due to uncertainty in offset prices, eligibility, and demand. DRA does not agree with all of the uncertainties identified in the Draft Report, and attempts to address the concerns below by proposing methods to account for the uncertainties identified in the Draft Study. It is true that GHG offset prices are not yet based on actual market prices, but as discussed above, a reasonable estimate of GHG offset prices is discernible from various price points available today. Additionally, uncertainty about eligibility is unfounded because the CARB Livestock Projects Compliance Offset Protocol verifies that dairy biogas projects are eligible to generate AB 32 compliance offsets.<sup>9</sup> The basis for uncertainty in the demand for GHG offsets is also not clear. The offset supply forecasts that DRA is aware of indicate that the potential supply from projects developed under the existing four CARB Compliance Offset Protocols, as well as from CARB-approved early action protocols, will be significantly short compared to total potential demand.<sup>10</sup> The investor-owned utilities (IOUs) alone will have significant demand for GHG offsets under the AB 32 Cap-and-Trade program. DRA acknowledges some uncertainty in the long-term demand for GHG offsets, as the current CARB Cap-and-Trade regulation only goes through 2020. However, California is committed to an aggressive 2050 GHG reduction goal which would likely be met by extending the existing programs such as Cap-and-Trade.

DRA recommends that the Commission direct the IOUs to recognize uncertainty regarding actual market prices for GHG offsets and the long-term demand for GHG offsets by incorporating appropriate provisions into the terms of power purchase agreements (PPAs)

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<sup>8</sup> Sanchez, Daniel, Dairy Biogas in California: Cost-Effective Development, April 2013, pp.17-21. Available at: [http://rael.berkeley.edu/sites/default/files/Sanchez\\_Biogas\\_in\\_California\\_Masters\\_Draft\\_April\\_2013.pdf](http://rael.berkeley.edu/sites/default/files/Sanchez_Biogas_in_California_Masters_Draft_April_2013.pdf)

<sup>9</sup> California Air Resources Board, Livestock Projects Compliance Offset Protocol of the Cap-and-Trade Regulation. Available at: <http://www.arb.ca.gov/cc/capandtrade/protocols/livestock/livestock.htm>

with dairy biogas projects. As with any uncertainty in a long-term PPA, IOUs and their counterparties should be able to negotiate terms that all parties will accept and that represent a level of risk investors and financiers are willing to incur. For instance, a 15-year PPA between an IOU and a biogas generator could include a term that ensures the IOU will purchase GHG offsets generated from the facility at a given price (or correlated to GHG offset market prices), thereby reducing the cost of electricity by a corresponding amount. This will ensure the ratepayers financing these biogas projects receive at least some benefit from the potential GHG offset revenue and are not locked into paying imprudent contract prices.

*(3) **LCOE Model.** Several parties also indicated, again both at the workshop and in pre-workshop written comments, a desire to see refinements to the draft LCOE Model (Excel) that was used to inform the cost estimates in the draft consultant study. A link to the LCOE Model is provided this e-mail but the file is locked so that it cannot be edited directly. If you have identified specific refinements that would improve the LCOE Model, please provide in written form:*

- a) A description of how the proposed refinement of the LCOE Model would have a material impact on the LCOE estimates provided in the draft consultant study; and,*
  - b) A written guide that clearly identifies which Cell should be modified, how it should be modified, and why.*
- a) As described above, the proposed refinement to the LCOE Model would significantly lower the LCOE estimate for dairy biogas projects and would represent a more accurate and realistic LCOE.
- b) The SB 1122 LCOE Calculator should be modified to include a line for GHG offset revenue in the incentives category. Specifically, on the Cost of Generation *Calculator* tab, a row of three cells should be inserted in the incentives category (J10, K10, and L10). The text in cell J10 should read “GHG Offset Revenue” and the cell L10 should be linked to a new cell in the *Entries* tab (F36). In the *Entries* tab, a row of four cells should be inserted in the incentives category (C36, D36, E36, and F36). Cell C36 should read “GHG Offset Revenue (\$/year)”

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<sup>10</sup> American Carbon Registry, Compliance Offset Supply Forecast for California’s Cap-and-Trade Program (2013-2020), September 2012. Available at: <http://americancarbonregistry.org/acr-compliance-offset-supply-forecast-for-the-ca-cap-and-trade-program>.

and cells D36 and E36 should represent the selected case and user modifications (as with all other rows). The selected case should be based on the ESA Report productivity assumptions for GHG reductions per cow (i.e. 7.450 MT/CO<sub>2</sub>e per cow per year), the total number of cows per project (i.e. 5,500 head of cattle for a 1 MW project per the Draft Study), and a GHG offset price of \$10/MT CO<sub>2</sub>e. The user modifications can reflect any changes to those assumptions (e.g. a less conservative GHG offset price of \$20/MT CO<sub>2</sub>e; a reduced productivity assumption; or a different number of cows). Cell F36 should be the model input for GHG offset revenue, representing the sum of D36 and E36 (as with all other rows) and should be linked to cell L10 on the *Calculator* tab. These modifications should occur to ensure GHG offset revenue is considered in calculating the LCOE for dairy biogas projects.