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SUMMARY OF COMMENTS & RESPONSES DRAFT LIVESTOCK PROJECT PROTOCOL VERSION 4.0

4 sets of comments were received during the public comment period for the Climate Action Reserve (Reserve) draft Livestock Project Protocol Version 4.0. Staff from the Reserve summarize and provide responses to these comments below.

The comment letters can be viewed in their entirety on Reserve's website at <http://www.climateactionreserve.org/how/protocols/us-livestock/rev/>

COMMENTS RECEIVED BY:

1. Camco International Group, Inc. (**Camco**)
2. Michigan State University (**MSU**)
3. Sage Metering, Inc. (**Sage Metering**)
4. University of California (**UC**)

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3.2 Project Start Date

1. The Reserve has modified the project start date language so that developers have 6 months to select a start date from when manure is first loaded into the digester. In Camco's experience, digesters are often pre-loaded with lagoon water and heated before fresh manure begins to be added. This process can take 6 weeks or longer. It would be helpful to clarify that the loading of the digester refers to continuous loading with fresh manure and not the pre-loading/preparation process. This may avoid confusion going forward. **(Camco)**

RESPONSE:

The project start date definition was modified to maintain consistency with the Organic Waste Digestion protocol Version 2.0. The definition provides an ample window of time (6 months, or approximately 26 weeks) for startup activities, including those described in the comment, before the project start date must be set. The inclusion of 6 weeks of "pre-loading" activity should not significantly restrict the project's flexibility on choosing a start date. We believe "first loaded" is sufficiently clear in most cases. However, where there is ambiguity, verifiers may exercise professional judgment when assessing the project developer's evidence in support of the project start date.

3.4 Uncontrolled Anaerobic Baseline

2. The new version requires developers to demonstrate that an uncontrolled anaerobic manure management system was in operation prior to the digester. Camco requests clarification here to make sure that facilities which use aerobic and anaerobic management components will still be eligible. For example, many dairies will have three or four different methods for managing manure, one of which may be uncontrolled anaerobic lagoons. **(Camco)**

RESPONSE:

This requirement has not been changed from Version 3.0 of the Livestock Project Protocol, though the language has been modified for clarity. Facilities with multiple baseline manure management systems can still be eligible. By following the quantification guidance in Section 5 of the protocol, such facilities can accurately characterize the baseline emissions from manure that was managed in the eligible systems.

3.4.1 Existing Livestock Facilities

3. In the *first* paragraph of Section 3.4.1, the proposed requirement that the 5 year period occur "immediately" prior to the start date is inconsistent with the definition of start date since the start date is the start of operations and not the start of construction. Ample time should be allowed for construction prior to the project's start date. It may be beneficial to define start of construction as another recognized milestone and to use start of construction in the protocol. For example, the wording may be revised to read "...developers of livestock projects must demonstrate an uncontrolled anaerobic manure management system was in place for the a period of five years immediately prior to the start of construction for the project's start date." Alternatively, if the start of construction is not used as a project milestone, at a minimum consider deleting the word "immediately" before "prior to" in the first paragraph.

Similarly, in the *second* paragraph of Section 3.4.1, the proposed requirement that the

uncontrolled anaerobic manure management system be in place “at all times” prior to the start date is inconsistent with the definition of start date. For example, the wording may be revised to read “...developers of livestock projects must demonstrate that an uncontrolled anaerobic manure management system was in place at all times up until start of construction for the project’s start date. (UC)

RESPONSE:

It was not the intent of this section to require that the anaerobic baseline system be maintained as operational during the allowed 6 month startup period as defined in Section 3.2. The language in Section 3.4.1 has been revised to clarify that the anaerobic baseline requirement is assessed prior to the manure being loaded into the project digester, and that disruption of the anaerobic baseline condition is acceptable for the construction of the project digester system. The verifier may use professional judgment to confirm that the anaerobic baseline requirement has been met.

4. The first paragraph of Section 3.4.1 appears to have an error in the first sentence which is probably intended to read “For livestock facilities that have been in operation for more than five ~~two~~ years, developers...” (UC)

RESPONSE:

Though this was not an error *per se* (an “existing facility” is defined as one that has been in operation for more than two years), we agree that this change would make the sentence more clear in relation to the following paragraph and have made the change accordingly.

5.2 Calculating Project Methane Emissions

5. The Reserve specifies that developers must use the default for Biogas Collection Efficiency specified in Table B.4. We recommend the Reserve permit developers to use a site-specific value for BCE as determined through independent analysis. (Camco)

RESPONSE:

We agree this would add flexibility to the protocol. However, the use of conservative default factors for BCE follows accepted practice for offset project accounting for livestock digesters. The Reserve is not aware of any widely-accepted methodology for the accurate measurement of fugitive emissions from biogas collection systems that could lead to the development of reliable site-specific values that would be applicable over time. The use of a default factor in this case avoids the substantial cost, administrative, and verification burdens associated with having to assess and validate independent testing.

6. The Reserve has modified its language around determining a site specific Biogas Destruction Efficiency (BDE) for destruction devices to permit the use of an independent air emissions testing body that is accredited by a state or local agency, or the Stack Testing Accreditation Council (STAC). However, methane sampling and analysis of engine exhaust is not the same as stack testing for mass flux of regulated air contaminants and as such, the requirement for state or STAC accreditation is not warranted (and will contribute significantly to BDE analysis costs). Many states do not have 'accreditation' processes or requirements for testing exhaust gases for their State Air Permit testing - either from their state or ST AC, however states do require compliance with established sampling procedures. Our recommendation is to allow sampling of engine exhaust and analysis of such exhaust for methane concentration in accordance to EPA Method 3C (Methane analysis) by certified laboratories or qualified field

personnel. This would be more practical and lower costs and be similar to the sampling of biogas to determine methane concentration - samples may be taken by staff on-site and sent off to certified laboratories for testing. One would also need to understand the volume of exhaust (flow) in addition to the methane concentration in that exhaust. This would require an understanding of the velocity of exhaust coming out of the engine exhaust pipe – however the main point is still that this does not require a specialty testing company. **(Camco)**

RESPONSE:

At this time the Reserve is not comfortable with further relaxation of the requirements for the determination of a site-specific value for biogas destruction efficiency (BDE). The BDE value for a project destruction device is an area of high risk in the calculation of emission reductions, and has a significant impact on the quantification of project emissions. Since a site-specific value is determined at a single point in time, rather than on a continuous basis, its accuracy is very important. In order to increase flexibility in the selection of an emissions testing service provider, the updated protocol includes an expanded list of acceptable credentials which includes accreditation from the Stack Testing Accreditation Council. In addition, a service provider which is accredited by a different state than the one in which the project is located would be acceptable for this testing.

EPA Method 3C is not itself sufficient for the determination of BDE. This determination requires simultaneous measurement of inlet and outlet methane volumes, which in turn requires precise measurement of biogas flow volume and methane concentration at both locations. EPA Method 3C is only applicable for the analysis of the methane content of a single gas sample. This test would need to be accompanied by additional procedures for the determination of exhaust gas flow volume and for the proper exhaust gas sampling for methane content.

6.1 Site-Specific Determination of Maximum Methane Potential (B₀)

7. Camco welcomes the Reserve permitting developers to determine site-specific B₀ values through sampling. However, the regime that the Reserve outlines is overly prescriptive and may in some cases be unworkable as well as result in significant costs. Camco suggests the following changes:
 - a) Flexibility on sample location and mixing samples from all animal types – as it may not be feasible to isolate one animal type from another if housed within the same barn area or that barns that have a common manure collection system or pipeline. Samples in a common collection/pumping pit over the course of a single day will account for variations that might occur in manure from different animal housing areas.
 - b) Samples should be able to be taken in April or October or any other month that represents the average annual temperatures for the site. Why limit to August – October? To save costs we would like to be able to take samples ourselves whilst onsite for verifications.
 - c) Provided the feed to the cows has not changed (feeding formulas do not change every few weeks), a second sample, 2 weeks after the first, will add significant cost and should not provide any significant difference to B₀ testing results. Camco suggests a requirement to take 1 sample (over a minimum 8 hour period) and split and analyze by triplicate.
 - d) The control assay should not include a positive control with glucose/cellulose – rather a control of just seed inoculum by itself should be run along with the samples - which will allow proof of biogas production and enable the contribution of biogas from the seed stock to be deducted from the total biogas production. A single sample run with glucose/cellulose does

not necessarily provide adequate biogas production comparison of manure digestion potential if off by more than 15%. Rather an analysis of the tested $B_{0,L}$ should be provided by the laboratory conducting the test to compare the result to experience or other literature values.

- e) Camco recommends using the mean rather than 90% LCL if the highest and lowest values have already been removed from the statistical analysis as the arithmetic mean will account for both higher and lower measured values.
- f) B_0 values should be good for the entire year that a particular harvested feed is being used during which samples were taken – not the following calendar year when another harvest will provide the animal feedstock for that year. **(Camco)**

RESPONSE:

The B_0 value is an area of high risk for the calculation of emission reductions, and this sampling and analysis methodology is completely novel for the generation of greenhouse gas offsets. As such, the Reserve believes it is appropriate to move cautiously and to err on the side of conservativeness and rigor. During the development of this methodology the Reserve staff consulted with several experts from academia and industry to identify a testing protocol that would be rigorous, yet practical, and would control for significant sources of variability wherever possible. With that in mind, below are specific responses to the sub-comments above.

- a) Because of the way that the emission reduction calculations are carried out, it is necessary to have a B_0 value for each animal category. A composite B_0 value would only be appropriate if the relative populations of the animal categories did not vary at all during the reporting period. The calculation of baseline emissions is carried out on a monthly basis, using the monthly population figures for each animal category. A composite B_0 value would not only represent the animal categories that contributed manure to the samples, but also would be weighted by their relative populations at that point in time, leading to inaccuracy as those relative populations change from month to month.
- b) The Reserve identified August through November (changed from October in the draft) to be the months with historically below-average milk production, and thus the most conservative time for B_0 sampling and analysis. Milk production is a useful indicator for increases or decreases in the B_0 value over time. Periods of higher milk production tend to coincide with periods where the B_0 value of the manure is also higher, and vice versa. To determine the most conservative time of year for the sampling and analysis procedure, the Reserve consulted the National Agricultural Statistics Service data on national milk production (in lbs/head) for each month for the years 1998-2011. The milk production for each month was compared to the average monthly milk production for that year, highlighting monthly trends in milk production and controlling for the trend of increased milk production year-over-year. There was a consistent monthly pattern of milk production for every year during this time period (see Figure 1 below).
- c) Agreed. The sampling methodology has been amended to require only one single-day sampling event.
- d) It is assumed as part of the calculation of maximum methane potential that the lab will always conduct a control of the seed inoculum itself and deduct the methane potential from that of the manure sample results. This activity will be added to the procedure for clarity. The glucose control was recommended by testing experts as a confirmation of the overall viability of the seed inoculum, rather than a direct component of the determination of methane potential for the manure samples.
- e) Since the sampling has been reduced from two events to only one event, the laboratory analysis will provide six results, rather than twelve. Due to this reduction in the sample size, the outliers will no longer be discarded, but the Reserve believes that it is appropriately conservative to use the 90% LCL as the result, rather than the arithmetic mean.

- f) The applicability of the site-specific B_0 value has been updated to apply to the reporting period during which the sampling occurred. There are a number of considerations when determining the applicability of this figure. Each policy option has positive and negative consequences, and the Reserve has determined that this option strikes the most appropriate balance.

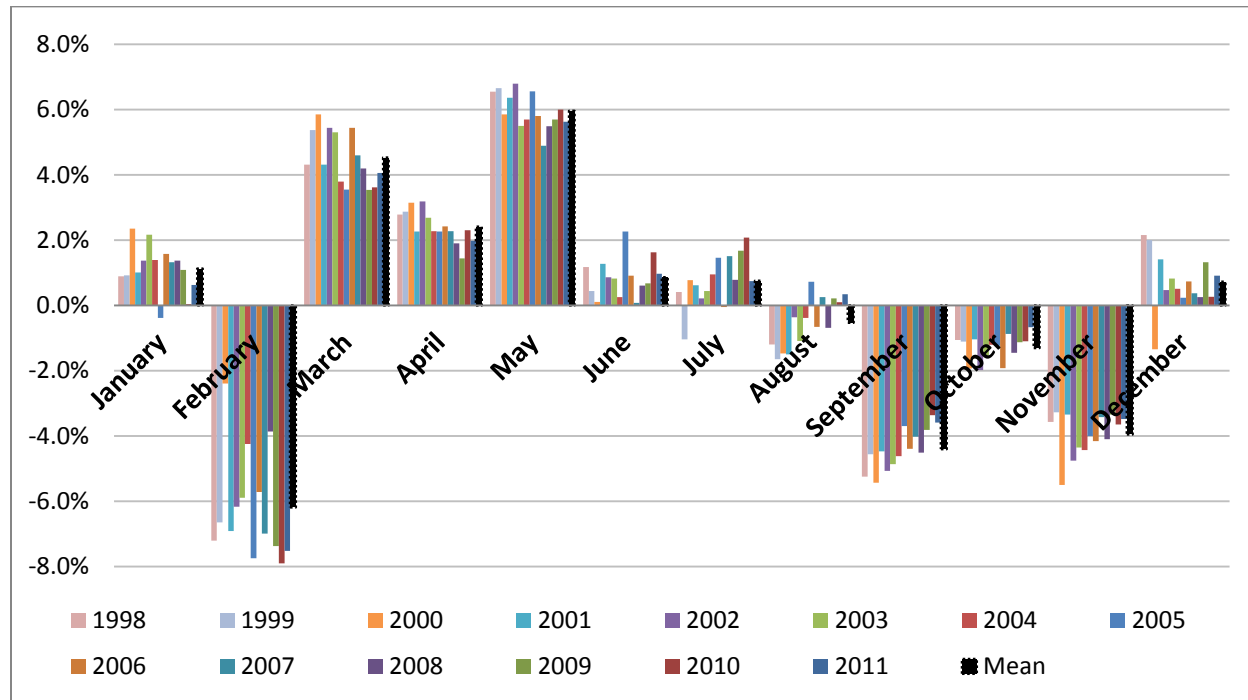


Figure 1. Monthly milk production rates (lb/head) compared against the annual average monthly production rates for each year (0% represents a monthly production rate equal to the average monthly production rate for that year) (National Agricultural Statistics Service).

8. Sample periods should be allowed during a comparable period in the spring: April to June. Sampling 2 weeks apart should not provide any differences in manure characteristics as practices and feed rations do not change that quickly.

Rather than sample from each animal category, I would consider using a sample of the digester feedstock collected immediately before entering the digester. Collecting the mixed material will provide the most accurate representation of the input material. Mixing, pumping and blending with other animal manures may cause changes in the biogas potential that would not be identified by testing individual materials. **(MSU)**

RESPONSE:

It is important to be clear that the protocol is not attempting to estimate the biogas production of the project digester system, but rather the methane emissions from eligible manure streams that were managed in the baseline management system. The project digester system may also include ineligible waste streams for which baseline emissions should not be calculated. Project emissions from the methane produced and destroyed by the biogas control system are estimated using direct measurement of biogas flow and methane content. Please also see the response to comment 7(a, b, and c) above.

6.3 Biogas Measurement Instrument QA/QC

9. The Reserve has added an additional paragraph specifying that meters which are removed and not reinstalled should be field checked for calibration accuracy prior to removal. In some cases meters are removed because the screen may not be working or they may be damaged and thus it may be difficult or impossible to verify their calibration accuracy prior to removal (many meters have to be removed from the gas pipe in order to be calibrated in any case). The protocol should provide developers with flexibility to replace damaged meters provided they can document when the meter was damaged and show that the meter was in calibration prior to being damaged. For example, developers could use historic gas flow data to show the meter continued to function correctly. **(Camco)**

RESPONSE:

Meters must be in calibration at the time of installation, and the protocol allows for a meter to be in use for up to 60 days after the last field check or calibration (page 34 of the protocol). However, it has become clear that projects are occasionally replacing metering equipment during a reporting period, sometimes more than once in a single reporting period. If a meter is used for more than 60 days, it is important to confirm the accuracy of that meter. The current requirement for a field check at the end of the reporting period is not sufficient to confirm the accuracy of a meter that is no longer in service, and thus the additional requirement is necessary. Neither this nor any other Reserve protocol for methane destruction activities has any procedures for the use of historic data to demonstrate meter calibration.

10. I recommend a slight change to footnote 33 (page 34) to clarify what standard conditions are of the volumetric flow. I recommend the following rewording for the footnote: "Field checks and calibrations of flow meters shall assess the volumetric output of the flow meter in Standard Cubic Feet (SCF) at 1 atm pressure and 60°F temperature." **(Sage Metering)**

RESPONSE:

Agreed, thank you for your comment.

Appendix B Emission Factor Tables

11. Table B.10. Baseline Assumptions for Greenfield Projects: In Camco's experience, some dairies drain their lagoons in October / November rather than September - this is to some extent dependent on dairy location. Camco requests that the Reserve permit developers to use a later month if common practice by other dairies in the region supports this. **(Camco)**

RESPONSE:

The intent of the default baseline assumptions for greenfield projects is to avoid having individual projects develop their own rationales for common practice in their area, which must then be assessed by the verifier. The values developed by the Intergovernmental Panel on Climate Change (IPCC) for the Methane Conversion Factor (MCF) for uncovered anaerobic lagoons (Table B.6 of the protocol) were developed using the method described in Mangino et al. (2001), which assumes that the lagoon systems would be drained annually at the end of September. Although it may be the case that some dairies drain their lagoons on a different schedule, we have followed this established assumption in order to be consistent and conservative, and to avoid the need to evaluate case-by-case assertions about baseline conditions.

Appendix D Data Substitution

12. We recommend that data substitution be allowed for period of time greater than 7 days. There are many examples of missing data that can reasonably be accounted for with statistical analysis of periods of time before and after the missing data event provided that there is additional indication of either flow or destruction of biogas. The EPA Acid Rain Program upon which the Reserve data substitution procedure is based (and which was referenced in previous protocol versions), allows for data substitution for periods greater than 7 days. For many dairies, especially smaller ones, it is difficult to diagnose a problem, order replacement parts, ship replacement parts and have them installed by an appropriate person within a 7 day timeframe. The end result is repeated variances costing time and money. **(Camco)**

RESPONSE:

At this time the Reserve is not comfortable allowing data substitution for gaps greater than seven days in all cases. Data substitution introduces risk, uncertainty, and complexity to both the calculation of emission reductions as well as the verification of those calculations, and should thus be used only in limited circumstances. This data substitution methodology was developed through public consultation and is applied to multiple protocols in the Reserve program.