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SUMMARY OF COMMENTS & RESPONSES DRAFT LANDFILL PROJECT PROTOCOL VERSION 4.0

18 sets of comments were received during the public comment period for the Climate Action Reserve (Reserve) draft Landfill 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/adopted/landfill/landfill-project-protocol-revisions/>

COMMENTS RECEIVED BY:

1. Advanced Systems, Inc. **(ASI)**
2. Appalachian Energy Center **(AEC)**
3. Black Warrior Solid Waste Disposal Authority **(BW)**
4. Blue Source on behalf of Montauk Energy, Commonwealth, Clean Energy, SunOne Solutions, Interstates, SES LLC, LFG Technologies, DNV, Cambrian Energy, Berkeley County Water & Sanitation, Athens-Clarke County (Georgia), Decatur County (Georgia), Appalachian Energy, CE2 Capital Partners, Environmental Capital, Energyneering Solutions Inc, Verdeo Partners, C2I Methane Partners, Granger, GT Environmental Finance LLC, Crosswired LLC, and Green Energy Advantage LLC **(Blue Source et al.)**
5. Carolan Associates **(Carolan)**
6. Coffee County, Alabama **(CC)**
7. DTE Biomass Energy **(DTE)**
8. Element Markets and Veolia Environmental Services: North America **(EM&V)**
9. Law Offices of Jeremy D. Weinstein **(Weinstein)**
10. NSF International Strategic Registrations **(NSF-ISR)**
11. PPL Renewable Energy **(PPL RE)**
12. Richardson Smith Gardner & Associates, Engineering & Geological Services **(RSG)**
13. Rosen Harwood Attorneys at Law, on behalf of Black Warrior Solid Waste Disposal Authority and Coffee County, Alabama **(Rosen Harwood)**
14. Sage Metering, Inc. **(Sage)**
15. Science Applications International Corporation **(SAIC)**
16. Sustainable Energy Solutions LLC **(SES)**
17. TerraPass Inc. **(TerraPass)**
18. Verdeo, A Sindicatum Carbon Capital Company **(Verdeo)**

General Comments:

1. We would like to support a number of the proposed revisions to the Landfill Project Protocol including:
 - The revised definition of the project start date in Section 3.2 to include an optional a 45 day start-up period. The current project start date definition is inflexible and may also be questionable based on the date of initial operation of the destruction device
 - The opportunity for a second 10-year crediting period as outlined in Section 3.3. This option extends the viability of projects at closed landfills that will never be subject to NSPS or at Tier 2 landfills that will never reach the NSPS threshold
 - The amendments to Section 6.2 to remove the requirement that flow meters and gas analyzers be cleaned and inspected on a quarterly basis. This option provides additional flexibility and puts the onus on project developers to define the frequency of field checks required to minimize meter and analyzer inaccuracies

We believe that these changes will reduce the administrative burden on Project Operators and provide additional flexibility to Project Developers, without sacrificing the accuracy or conservativeness of the protocol's approach. We appreciate that the Reserve has listened to input from project developers in evaluating and now proposing these revisions. **(Blue Source et al., DTE, Verdeo)**

RESPONSE: Noted.

2. Ensure that projects registered under a protocol version prior to Version 4.0 will not be encouraged or directed to move to Version 4.0 through other registration or issuance processes such as:
 - o Variances. A project seeking a variance against an earlier version will not be required to move to Version 4.0 (or later) in order to attain the variance;
 - o Attestations. Attestations will not be amended in such a way as to effectively require projects to move to Version 4.0 (or later). **(Verdeo)**

RESPONSE: When a new version of a project protocol is adopted, it does not affect projects that have already been submitted under previous versions of the protocol. Those projects would only be subject to requirements under the newer version if they choose to upgrade at a subsequent verification. By the same token, there may be aspects of a newer protocol that a project would wish to take advantage of, in which case they would need to upgrade to the newer version and be subject to all requirements contained therein. Please refer to Section 4.3.3 of the Program Manual for further guidance.

3.3 Project Crediting Period

3. Is the second crediting period limited to only projects that first list under Version 4.0? Will other projects registered under previous versions of the Protocol be eligible for a second crediting period?

We strongly recommend that other landfill projects currently registered under earlier versions of the Protocol also have the opportunity for a second 10-year crediting period. We do not see a

definitive difference between projects listing under Version 4.0 and other previously registered projects in terms of being eligible for a second crediting period. **(EM&V)**

RESPONSE: Projects may upgrade to the latest version of the protocol at any time in order to qualify for a second crediting period, including at the conclusion of their first crediting period. When the project is submitted for consideration for a second crediting period, it must meet all the requirements contained in the most current version of the protocol (i.e., landfill V4.0 or later).

4. Add specific language into Version 4.0 that addresses the use of prior versions of the protocol during crediting periods. Section 3 Eligibility is the most suitable place for such comments to be embedded. Specifically, we recommend adding the following language: “Projects registered under a previous version of the Protocol will remain eligible according to the requirements in that version through the end of the crediting period.” **(Verdeo)**

RESPONSE: This is already a general Reserve policy. Please refer to Section 4.3.3 of the Reserve’s Program Manual.

3.4.1 The Performance Standard Test

5. The expanded additionality tests, if implemented as proposed, would radically alter the carbon market landscape in the U.S. by unnecessarily restricting the supply of GHG offsets and result in higher levels of GHG emissions than would otherwise exist were the status quo additionality requirements maintained. From a macro-scale perspective, the proposed additionality tests are also disconcerting as they would virtually mandate that future landfill gas projects earning CRTs are operated in the most economically unproductive and resource-inefficient manner as possible. In fact, the proposed prohibition against the use of energy from landfill gas projects earning GHG offsets appears contrary to some of the most stringent and highly credible certifications available for GHG offsets such as the CDM Gold Standard. **[See public comment submission for more detail.] (AEC)**

RESPONSE: The proposed performance standard does not prohibit the use of energy from landfill gas projects earning GHG offsets. Rather, it places limits on the eligibility of such projects in order to ensure that only “additional” projects are registered – i.e., those that would not have happened in the absence of GHG market incentives. It is precisely the projects that are otherwise economically marginal that are most likely to be additional. Conversely, the most economically productive and resource-efficient projects are more likely to be non-additional. Ensuring additionality is a core principle of all carbon offset programs, including the CDM Gold Standard.

Although increasing the stringency of additionality tests may result in foregone opportunities to reduce GHG emissions at landfills, it will not result in an increase in GHG emissions globally. This is because the offset buyers who would have invested in landfill reductions will instead invest in other GHG reduction opportunities in order to meet their obligations. The real danger from a climate change perspective is to issue offset credits for activities that are non-additional, which *will* result in higher global emissions because the credit buyers’ emissions will continue unabated while landfill emissions remain unchanged. It is for this reason that most carbon offset programs

(including the Reserve) place a premium on stringent additionality tests, even at the cost of erroneously excluding some truly additional projects.

6. The likely result of adoption of Version 4.0 including Criteria B (Size Threshold) or Criteria C (Renewable Energy Certificate/Green Power) will be the eventual dismantling of many collection and destruction systems. The fundamental economics have not changed. In large areas of the United States the sale of electricity will not generate sufficient revenue to pay for the required systems. As events arise causing existing collection and destruction projects to adopt proposed Version 4.0, projects which were additional when built, and which in fact remain additional, will be excluded merely by this protocol change. Income from the sale of GHG credits will be cut off. So long as the landfills which host the projects remain not mandatory, it is very likely that the systems will then be shut down due to operating costs or ongoing capital costs.

We respectfully urge the removal of Criteria B and C from Version 4.0 of the protocol. **[See public comment submission for more detail.] (BW, CC, Rosen Harwood)**

RESPONSE: As indicated in Appendix A of the draft revised protocol, the Reserve has determined that the previous landfill project performance standard is no longer sufficiently stringent and presents an unacceptably high risk of making “false positive” additionality determinations (i.e., incorrectly qualifying non-additional landfill projects). In light of comments received, we have decided not to include Criterion C in the revised protocol (please see response to Comment #22). We recognize that under Criterion B, the rate of “false negatives” (i.e., projects that are likely to be additional but are nevertheless excluded) is relatively high compared to the rate of false positives. As indicated above, however, minimizing false positives is a primary objective when setting a performance standard (please see response to Comment #5).

7. In our experience, LFG projects are commonly developed using a phased approach: Phase one includes the voluntary development of a LFG collection and destruction system and is used to assess the quality and composition of LFG recovered from a given landfill. If LFG flow rates are sufficient and energy market conditions warrant further investment then development of the LFGE project will be pursued as Phase two. Simple destruction projects do not generate any revenue for the project developer, therefore the investment in Phase one is only justified by the anticipated revenue from the sale of Verified Emission Reductions (VERs).

The information used to develop the revised Performance Standard Test, based on the US EPA's LMOP database, does not provide all of the information required to complete an accurate analysis of project economics and additionality. For example, the Reserve concluded that all non NSPS landfills with flares were required by state or local regulations and should be excluded. This assumption is incorrect; LFG projects are often developed using the phased approach and in many cases a Phase two project is never developed. **(Blue Source et al., SES)**

RESPONSE: While not a perfect resource, the US EPA LMOP database is currently the most comprehensive dataset related to landfill gas activities in the United States. The Reserve acknowledges that oversimplification may occur whenever assumptions are made, and has noted your comments related to this analysis. However, it should be noted that the new performance standard does not change the eligibility of “Phase One” projects described in the above scenario. Flare-only projects remain eligible at any size, provided they meet the other requirements of the protocol (Legal Requirement Test,

Practice Threshold). (Flare projects were excluded from the performance standard analysis because they were assumed to be additional by default; the performance standard does not exclude such projects from eligibility under the protocol.)

8. Analysis of the dataset in Appendix A.2 has determined that approximately 17% of unregulated landfills with renewable energy projects have done so without realizing revenue from GHG offsets. The Reserve is assuming that these landfills never pursued revenues from GHG offsets, or that these revenues were not included in project economics. While it is possible that project owners did not pursue GHG offsets because they did not need the money, I think it is much more likely that these landfills were unable to verify, market, and sell these offsets. The Reserve apparently relied solely on the EPA LMOP database of landfills to determine eligibility, even though NSPS regulatory status is the only criterion affecting additionality addressed in this database. I recommend broadening the scope of regulatory review beyond the LMOP database. The Reserve's protocol requires other regulatory issues besides NSPS applicability be examined during verification. I would argue that the data reviewed during protocol revision should look beyond NSPS compliance as well. **(RSG)**

RESPONSE: It is true that some of these projects may have been implemented in order to comply with state or local regulations that are not indicated in the LMOP database (as acknowledged in Appendix A of the draft protocol, footnote 31). Such projects would ideally be excluded from the analysis, in order to obtain a more accurate estimate of the "natural" market penetration of energy projects. Since we lacked data on how many of the projects at these landfills were in fact required by state or local regulations, we conservatively assumed that they were all unregulated. Should we obtain data suggesting that this assumption is overly conservative (i.e., data indicating that a substantial portion of these landfills are subject to state or local requirements mandating LFG collection and destruction) we will revise the performance standard accordingly. We are currently unaware of any such data.

9. From our very basic analysis [see public comment submission for analysis], we conclude that the EPA's LMOP database is not at all robust when taken at face value, and raises significant questions regarding its suitability for quantitative analysis. The Reserve could use statistical sampling techniques to quantify and then account, at least in part, for the large uncertainties inherent in the underlying data. We submit that not to do so creates an unreliable analysis, especially since the Reserve makes large simplifying assumptions prior to using the quantitative data, introducing significant uncertainties before the data is considered.

Reserve staff makes the following assumptions in its use of LMOP data (excluding NSPS landfills):

- Landfills with flares but no energy or carbon projects were obligated by regulation to install the flares;
- Landfills with energy projects were not obligated by regulation to install gas destruction systems; that is, these systems are entirely voluntary;
- Landfills with energy projects that are not listed on carbon registries did not require the financial incentives required by carbon revenue to be "viable."

Especially important is the second bullet; the performance standard's analysis relies heavily on the assumption that all landfill gas-to-energy projects at non-NSPS landfills are, by definition, installed for voluntary purposes unrelated to environmental conditions and regulations affecting the landfill. Based on our work with dozens of landfills, we do not believe this assumption to be

correct. We encounter many landfills with energy projects that were able to attract those projects *specifically because* a flare-based destruction system was required and installed prior to the energy project's installation.

We also note that an examination of *existing landfill gas destruction systems* as a means to discern the factors which will make *future* landfill gas destruction systems "viable" has inherent, strong, selection bias. The landfills with destruction systems in place found sufficient motivation – regulatory, economic, political, etc. – to put them there. The performance standard should question if a carbon revenue stream provides meaningful incentives for landfills without gas destruction systems to install and destroy methane. A preferable way to address this question is to examine landfills which have installed new collection capacity (which might qualify for carbon credits) in the past 3-4 years and ascertain what factors motivated the installation compared to those landfills without systems.

If the Reserve cannot accomplish, for whatever reason, an analysis that ensures more robust data accuracy, we recommend that no such analysis be undertaken at this time and that the standard be left alone until a more thorough analysis can be accomplished. **(TerraPass)**

RESPONSE: While not a perfect resource, the US EPA LMOP database is currently the most comprehensive dataset related to landfill gas activities in the United States. As indicated in Appendix A of the draft revised protocol, the Reserve has determined that the previous landfill project performance standard is no longer sufficiently stringent and presents an unacceptably high risk of making "false positive" additionality determinations (i.e., incorrectly qualifying non-additional landfill projects). Notwithstanding data limitations, we do not feel it would be appropriate to leave the performance standard as it is currently specified in Version 3.0.

The point that the performance standard should anticipate trends in the viability of projects at landfills without existing collection and destruction systems is valid. We would note that the LMOP data indicate there has been a significant expansion in the deployment of landfill gas-to-energy projects in the past 3-4 years (from 9.5% to 23.79% of unregulated landfills), suggesting that a more stringent performance standard is justified.

Regarding the assumptions about regulatory requirements at landfills with LFG-to-energy projects, please see our response to Comment #8. The Reserve will consider options for refining the landfill performance standard in future updates.

10. Some landfills use energy for onsite and immediately adjacent uses: piping gas to a wastewater treatment plant next door, leachate drying, floor heating, and other ancillary applications. The economics of these "hyperlocal" systems are entirely different from, and not comparable to, commercial use of the energy. If performance standards are adopted which segregate energy projects from other projects, we submit that hyperlocal projects be treated as a separate category and considered along with non-energy projects. **(TerraPass)**

RESPONSE: It was not the intention of the Reserve to include these "hyperlocal", or non-commercial, uses of landfill gas on-site when applying the new performance standard for LFGE projects. We will clarify the protocol's definition of LFGE projects in the Glossary of Terms in the final V4.0.

3.4.1 The Performance Standard Test (A) Practice Threshold

11. Clarification and/or modification are needed to the provisions of Section 3.4.1 regarding the practice threshold for the second crediting period. We note that proposed rule 3.4.1(A), parts 1 through 4, now require an examination of the practice threshold as of the project start date. One example would be part 1, installation of a landfill gas collection system and new qualifying destruction device where landfill gas was not collected and destroyed prior to the project start date. As an example, assume this rule was met through installation of new equipment and that the project start date was 2010. What test would apply in 2020, under the proposed sentence “[T]he practice threshold is applied only at the time the project is registered or when it is submitted for a second crediting period.” Would equipment qualifying at the time of the project start date be sufficient, or would installation of a new collection and destruction system be required?

This provision should be revised to read: “[T]he practice threshold is applied only at the time the project is registered or when it is submitted for a second crediting period; provided that satisfaction of the practice threshold at the time the project is registered is sufficient when the project is submitted for a second crediting period.” **[See public comment submission for more detail.] (Rosen Harwood)**

RESPONSE: It is not the Reserve’s intent to require a new destruction device in order to qualify for eligibility under a second crediting period. The protocol clearly links the application of the practice threshold (under each eligible scenario) to the project start date. The project start date does not change for the second crediting period. However, to be eligible for a second crediting period, the project would have to meet the practice threshold as specified in the most current version of the protocol. Because the threshold itself may change in future updates to the protocol, it is necessary to state that the practice threshold will be applied when the project is submitted for a second crediting period. The language in the protocol has been amended for clarity.

12. All projects which qualify under #2 will, by definition, qualify under #1 since #1 notes that gas cannot be “collected and destroyed.” Since in #2 gas is not destroyed, by definition it is not “collected and destroyed.” To simplify, both points could be replaced with a single point which requires that landfill gas has never been destroyed, since whether or not it has been collected is not relevant to the practice threshold. For example:

1. Installation of a new qualifying destruction device at an eligible landfill where landfill gas has never been destroyed in any manner prior to the project start date.

This would allow language throughout the protocol referring to “collection and destruction” to refer simply to “destruction.” **[See public comment submission for more detail.] (TerraPass)**

RESPONSE: Though these two scenarios are very similar, the Reserve felt that it was important to include both scenarios for completeness. They are both distinct baseline situations that characterize landfill gas projects that are submitted to the program.

13. The paragraph which begins “Under scenarios...” is confusing. Points #1-3 already state clearly that a new qualifying destruction device must be installed, so this sentence may be deleted for

simplicity. Then the paragraph addresses wellfield expansions with reference to points #1 and #2. This is confusing since #1 specifically excludes landfills with any kind of collection system (hence any collection wells) and #2 includes only systems with landfill vents, which again are not collection wells. The language creates confusion regarding the ability of a fully qualified landfill (type #1 or #2), which meets all criteria, to add wells to its qualified collection system at a later time within the crediting period.

To clarify, we suggest reference to points #1 and #2 be deleted in this paragraph and the remaining language be embedded within points #3 and #4 since the requirements for each are somewhat different. If there is a nuance here regarding active venting systems (in which the vents are active collection wells), then that rather uncommon situation could be called out as a special case to the general eligibility of landfills without previous destruction activities. **[See public comment submission for more detail.] (TerraPass)**

RESPONSE: This paragraph does not hinder the ability of a landfill to expand its well field, but rather limits the ability to claim a well field expansion as a “new, separate project”. The intention of the paragraph is to clarify that such expansion may only constitute a new, separate project under Practice Threshold Scenario #4. We will amend the language in this paragraph to ensure that this distinction is made clear.

3.4.1 The Performance Standard Test (B) Size Threshold (LFGE Projects Only)

14. The Size Threshold (LFGE projects only) update is supported by an analysis that is incomplete in several respects. The analysis in Appendix A ignores the effect of time on methane production. The sample set of projects chosen to support the conclusions of this section exclude LFGE projects in which the project start date diverges by more than three years from the date waste in place was reported. While the stated reason for excluding these landfills is to control for temporal disparity, this methodological choice doesn't actually provide this control, but instead simply ignores the effect of age (time since closure) as a factor in the economic viability of LFGE projects. Because methane production in a landfill peaks shortly after closure and declines steadily thereafter, any LFGE project is most viable shortly after the landfill closes – as time after closure increases, LFGE projects become less viable without revenue from the sale of environmental commodities such as GHG offsets.

Given that the stated basis for the size threshold is the amount of methane being produced, a far more accurate and realistic control for temporal disparity would relate the amount of waste in place to the time since the landfill's closure. Precipitation levels have a much greater impact on the rate of methane production than on the total volume of methane a landfill will produce over its lifetime, and methane production from landfills in “wet” areas is far higher than in “dry” areas shortly after the landfill closes. However, as the time after closure increases, landfills in “wet” areas have less methane production than their counterparts in “dry” areas, and within a decade after closure landfills in “wet” areas are far less viable candidates for a LFGE project than the exact same landfill in a “dry” area because of the comparatively rapid decline in methane production experienced by landfills in “wet” areas.

So, the additionality of GHG offset revenue for LFGE projects located in “wet” counties increases in direct proportion to the time since the landfill's closure. The flow of methane, or

energy, from a landfill is a function of both the amount of waste in place and time since closure. Waste volume and time are interrelated and inseparable variables for any accurate assessment of LFGE viability, and either factor alone is insufficient to serve as a proxy indicator of methane production, and therefore insufficient for use as the sole determinant of additionality as pertains to the necessity of LFGE projects receiving GHG offset revenue in order to be viable. **[See public comment submission for more detail on economic viability of LFGE projects.] (AEC, Blue Source et al.)**

RESPONSE: In examining the LMOP database, the Reserve did not find any clear correlation between WIP reporting dates and landfill closure dates. In some cases WIPs were reported at the time of landfill closure, in other cases subsequent to closure. There is also no discernible trend for whether WIP was reported before or after the project start date. It is therefore not clear that controlling for the temporal disparity between project installation and WIP reporting misses any important trends related to time since closure. It is true that gas production will decline after a landfill has closed. However, simply exempting closed landfills from the WIP threshold appears to significantly increase the risk of accepting “false positive” projects (a significant number of closed non-NSPS landfills have installed LFGE projects). It may be possible to develop a threshold for closed landfills linked to gas production potential. The Reserve will continue to explore this possibility for a future update to the protocol.

15. We would like to note that the EPA Mandatory Greenhouse Gas Reporting Rule adjusts the k factor for bulk waste at a threshold of 40 inches of precipitation per year. We believe that the Reserve should consider this threshold for determining which counties are wet and dry. **(EM&V)**

RESPONSE: There are different references available with differing definitions of the threshold between wet and dry, or arid and non-arid, regions of the country. The threshold of 25 inches is based on the U.S. EPA “Compilation of Air Pollutant Emission Factors”. AP-42 Fifth Edition, Volume I, Section 2.4: Municipal Solid Waste Landfills (<http://www.epa.gov/ttn/chief/ap42/ch02/index.html>). The Mandatory Greenhouse Gas Reporting Rule references the U.S. GHG Inventory guidelines, which use two thresholds, at 20 inches of precipitation and 40 inches of precipitation. This would result in a more complex performance standard, and would also necessitate further subdivision of the dataset, making the analysis less robust for each precipitation zone.

16. We believe that the current exclusion rate of almost 60% for landfills that are additional is much too high compared to the 5% inclusion rate of projects that are not additional. Using the analysis completed by the Reserve, we recommend that the WIP threshold for Wet Counties be located where the percentage rates for exclusion and inclusion cross, which appears to be around the 1,900,000 to 2,000,000 metric ton level. This threshold would only add a few percentage points to the amount of projects falsely included, while drastically dropping the exclusion rate of truly additional projects to around 12%. This would ensure that actually additional projects still have the opportunity to reduce greenhouse gas emissions, while also ensuring a stringent WIP threshold that excludes almost all non-additional projects. Thus, if the Reserve maintains WIP as part of the performance standard, we believe that the current WIP thresholds for Wet Counties are too stringent and should be reconsidered. **(EM&V)**

RESPONSE: The Reserve recognizes that the apparent rate of false negatives (landfills that are excluded but in fact are additional) is relatively high under the proposed standard compared to the rate of false positives (non-additional landfills that are able to

qualify). Our primary concern as an offset program, however, is to limit the number of potential false positives. Please see response to Comment #5.

17. Limiting the size of eligible landfills to such small arbitrary weight limits can unfairly impact the ability of some sites to qualify. In particular, some sites have a high percentage of “non-gas-producing” waste-in-place. Such waste may include construction and demolition debris, foundry sands, contaminated soils, well drillings, etc. The waste composition, compaction/density, type of cover used and final cap installed impact the potential gas generation as much as the “tons in place” number. It doesn’t make sense to penalize small sites that are already struggling to find a way to pay for a gas collection and control system. Keep the cutoff consistent with NSPS. (PPL RE, BW, RSG, SES)

RESPONSE: Please see response to Comment #16. With any standardized approach to project eligibility there will be exceptions that do not fit standardized assumptions. The Reserve will continue to consider options for refining the landfill performance standard, possibly including some of the variables identified here affecting landfill methane production, in future protocol updates.

18. In the last few years the characteristics of waste being accepted at landfills have been changing dramatically. New organic waste diversion programs have come online, altering the LFG generation potential of sites. Thus, we believe that general WIP does not provide an accurate enough assessment of LFG potential at sites to conduct this analysis thoroughly. (EM&V)

RESPONSE: Our research for the development of the Organic Waste Digestion and Organic Waste Composting protocols found that these organics diversion programs are not commonplace across the United States, and those that do exist are small in scale. As the science regarding the appropriate values for inputs for landfill emissions calculations progresses, the Reserve will update these factors in future versions of the protocol.

19. The analysis concludes that landfills over a certain WIP threshold do not need ER revenues in order to develop LFGE projects. Our analysis and experience suggests that the thresholds are very low and will severely impact the ability of new LFGE projects to move forward. By resetting the size threshold to the proposed WIP benchmarks, the eligibility criteria effectively eliminate any LFGE projects because a project below that threshold is simply too small to generate sufficient gas volumes for a power project. (Verdeo, Blue Source et al., Carolan, RSG, SES)

RESPONSE: Please see responses to Comments #5 and #16.

20. The Tons-in-Place (TIP) criterion is, from our perspective, too low. As a developer, the TIP for a specific landfill is one of the evaluation elements when looking at potential projects. One must also consider the age of the waste, the location, whether open or closed, and other aspects of the waste and the landfill. A landfill that closed in 1985 with 10,000,000 TIP might actually be releasing more landfill gas into the atmosphere than a site still open of 700,000 TIP. Neither may be a candidate for an energy project but the smaller site would be eligible for the Reserve. This difference would not meet an objective of minimizing GHG emissions. While it is true that there is an economy of scale associated with LFGE projects, the Reserve has significantly missed the mark regarding what size landfill can economically be developed without GHG incentives.

The minimum threshold for TIP should be raised for both arid and especially the non-arid regions and that it should only apply to waste that is in place for less than 10 years. **[See public comment submission for landfill WIP examples.] (Carolan)**

RESPONSE: Please see responses to Comment #5 and #16. Regarding the effects of time and precipitation on gas production at closed landfills, and how this relates to a static size threshold, please see the response to comment #14.

21. We do not understand the logic or analysis, and therefore do not support, the waste-in-place (WIP) thresholds being proposed. By imposing a further landfill size restriction above its current threshold, the Reserve would be excluding landfills that would still otherwise not be subject to regulations or requirements to collect and destroy landfill gas from eligibility. This will lead to sub-NSPS landfills being ineligible under the Reserve Landfill Project Protocol, but still not legally required to collect and destroy landfill gas. Is it not the goal of the Reserve to encourage such voluntary collection and destruction of harmful greenhouse gases that would otherwise vent directly to the atmosphere? We encourage the Reserve to rethink its logic and not impose additional eligibility criteria solely pertaining to landfill size. **(DTE, RSG, SES)**

RESPONSE: Regulatory additionality is only one component in the determination of overall additionality for a project activity. The Performance Standard Test is designed as a threshold that must be met in addition to the regulatory threshold. The goal of the Reserve is not to reward all voluntary landfill gas destruction, but rather the portion of this destruction that would not otherwise occur but for the incentive provided by the GHG offset market.

3.4.1 The Performance Standard Test (C) Renewable Energy Certificate/Green Power Exclusion (LFGE Projects Only)

22. The either-or tradeoff between RECs and GHG offsets does not accurately reflect market realities and appears to be justified based on the use of implicit assumptions of a questionable nature. Specifically, this proposed exclusion appears to rely heavily on the implicit assumption of an efficient market for both RECs/green power and GHG offsets when these environmental commodity markets are anything but efficient.

There is no national standard for renewable energy that would create a nationwide market with transparent pricing and an ability to trade these assets. The value of the REC varies considerably by region and individual states. There are projects that cannot go forward based on the energy and REC sale alone but might be viable with the GHG offset revenue as well. **[See public comment submissions for more detail about markets and suggestions for improving the landfill analysis.] (AEC, Blue Source et al., Carolan, DTE, SAIC, SES)**

RESPONSE: The Reserve acknowledges this and other comments regarding the uncertainties and lack of specificity in assumptions behind the proposed REC exclusion. A simple REC exclusion may fail to capture important regional differences in REC markets and regulatory requirements related to RECs. At the same time, as shown in the Table A.12 of the draft protocol, the application of the REC exclusion improved the effectiveness of the performance standard by a less than one percent reduction in false positives, with no change (or possibly a small increase) in false negatives. Due to

regional variations, it is not clear that the apparent small gain in stringency from this exclusion would be realized in all parts of the country, nor is it clear that false negative rates would be uniformly unaffected. Thus, the Reserve has decided to not include this proposed component of the performance standard test in version 4.0 of the Landfill Project Protocol. As markets evolve and more data become available, the Reserve may revisit its analysis of RECs for consideration in future updates to the performance standard.

23. The proposed Performance Standard Test is likely to reduce the opportunities for landfill methane to energy projects by constraining the economics to an “either/or” option. This will make investments in LFGE projects harder to find and harder to justify because it effectively removes one source of project return. Many US landfill projects do not have strong enough economics to support a positive investment decision without accessing all available revenue streams, including both VERs and RECs.

In addition to the basic financial viability, having multiple environmental commodities from a single project is also important from an investment standpoint because this reduces risk through revenue diversification. If one market fails, or the values drop then there is the potential that the other market will maintain viability and the project returns. For this reason it is easier to secure investment when both RECS and VERS are available for any given project. **(Verdeo, BW, Blue Source et al., CC, Carolan, DTE, RSG)**

RESPONSE: Please see the response to Comment #22.

24. Restricting eligible projects to selling either CRTs or RECs is ill-advised. At many landfills, the installation of a gas collection system and later a beneficial use project, are two separate and distinct projects (different assets with different lifespan). In some cases, the projects are owned and operated by different entities. Expected revenue from the sale of CRTs is often used to justify the installation of a gas collection system. Expected revenue from the sale of RECs (together with electrical energy) is used to justify the installation of a landfill gas-to-energy (LFGTE) plant. These are often two separate financial analyses performed by parties that may not be privy to the other project’s economics. **[See public comment submissions for more detail.] (PPL RE, Blue Source et al., BW, CC, Rosen Harwood)**

RESPONSE: Please see the response to Comment #22.

25. Section 2.2 Project Definition of Version 4.0 states that “*Projects that utilize landfill methane for energy generation may avoid GHG emissions associated with fossil fuel combustion. However, under this protocol such projects do not receive credit for fossil fuel displacement. Although the Reserve does not issue CRTs for fossil fuel displacement, it strongly supports using landfill methane for energy production.*” The REC and Green power exclusion that is part of this same document undermines support for LFGE because the revisions in Version 4.0 make such projects more economically challenging. There is therefore a contradiction in the Reserve’s intentions that should be addressed. **(Verdeo)**

RESPONSE: The intention of the updated performance standard is not to exclude LFGE projects, but to limit the issuance of CRTs to only those LFGE projects that are additional. Please see the response to Comment #5. However, the Reserve has decided not to adopt a REC exclusion as part of the performance standard for LFGE projects (see

Comment #22).

26. Reconsider the prohibition of a project receiving both RECs and GHG offset revenue either through an exception with a financial test or in combination with the size cutoffs. **(Carolan)**

RESPONSE: Please see the response to comment #22.

27. If the Reserve is determined to assess project eligibility on financial additionality (a marked change from Reserve methodologies), we would suggest a financial additionality test that is project specific (similar to what is done under the VCS protocol). This would allow the Reserve (or its designee) to see and determine for itself whether a LFGTE project would occur in the absence of a carbon offset market. This could be done during the project's application for registration for listing by the Reserve. The financial additionality test could be administered by the Reserve itself, or perhaps by Reserve-accredited verification firms. **(DTE)**

RESPONSE: The Reserve uses standardized performance thresholds, rather than project-specific determinations of additionality. Please refer to Section 2.1.1 of the Reserve's Program Manual for the details and rationale related to this policy. The Reserve's policy against using project-specific financial additionality tests does not mean that we ignore project economics in setting performance thresholds and eligibility conditions.

28. We believe that the analysis conducted by the Reserve has oversimplified the interplay between RECs and carbon offsets for LFGE projects. The Reserve assumes that projects not claiming both RECs and carbon offsets do not need both of these revenue streams to be viable. However, it is much more likely that these projects cannot claim both RECs and carbon offsets due to a variety of reasons, including the project being located in a state that does not maintain a Renewable Portfolio Standard (RPS) or the project being ineligible for carbon offsets due to non-regulatory reasons.

We recommend a more detailed and in depth analysis of project economics focusing on real world examples and project specific data. This will allow a more accurate representation of the current market for LFGE projects, instead of using one simplified database to make generalized assumptions about LFGE project economics. We believe that the new performance standard as drafted would severely hinder the development of new LFGE projects and recommend that it not be adopted. **(EM&V, RSG)**

RESPONSE: Please see the response to Comment #22. The Reserve will consider other options for refining the landfill performance standard in future protocol updates.

29. Proposed revisions seek to prohibit LFGE projects that sell RECs from qualifying under the protocol. These proposed revisions contradict the California Public Utilities Code and currently applicable regulations and Decisions of the California Public Utilities Commission (CPUC) under the California Renewable Portfolio Standard (RPS) and other applicable law.

The proposed revisions also add to the protocol a new "financial additionality" test differing from the prevailing formulation of financial additionality, and then apply that new test: (a) selectively against a single disfavored group and (b) making subjective assumptions without objective measurement and verification. These infirmities would create legal issues requiring review by the California Air Resources Board (CARB) should CARB wish to use the Protocol in connection

with the California Global Warming Solutions Act of 2006 (AB32). This new test should not be added to the protocol.

No provisions that contradict current California law and regulation should be added to the protocol. Additionally, no test should be added to the protocol that is discriminatory, subjective and cannot be applied without being measurable and verifiable. **[See public comment submission for detailed account of CPUC ruling concerning RECs and offsets as well as the financial additionality test concerning RECs.] (Weinstein)**

RESPONSE: Please see the response to Comment #22. Notwithstanding our decision to not exclude LFGE projects that receive RECs, it should be noted that nothing in such an exclusion would violate California law. The Reserve is a wholly voluntary program; participation in our program is not mandated by CARB, the CPUC, or any other regulatory body. The California RPS already includes dozens of landfill gas to energy projects that are generating RECs, but are not generating CRTs. With respect to applying a “financial additionality” test, please see the response to Comment #27. The concept of standardized additionality testing is clearly explained in the Reserve’s Program Manual (Section 2.4.1). Nothing in this approach precludes consideration of financial variables in establishing eligibility conditions. As stated in Section 2.4.1.2 of the Program Manual, “In developing performance standards, the Reserve considers financial, economic, social, and technological drivers that may affect decisions to undertake a particular project activity.”

30. It is not uncommon for LFGE power purchase agreements to confer the rights to all environmental attributes, including GHG offsets, to the purchaser of the renewable energy generated from the project. In return, the seller of the power receives a bundled price for the avoided cost of the power and the REC. This allows the purchaser, often an investor-owned utility, to utilize the value of the GHG offset, many times by internally retiring it to offset emissions from other non-renewable sources of energy. The Reserve and the other offset registries may never be aware of these actions, since the offsets are never registered or transacted through their programs. This does not diminish the value of the offsets to the project, however.

It is also not uncommon for an “unregulated” project that is generating RECs to fail additionality or eligibility tests for the landfill protocol. Several states (e.g., Wisconsin, Illinois, California) have more stringent rules that require installation of collection/control systems well before NSPS. So it is possible that, while not meeting the definition used in Appendix A, many of the landfills included in Table A.7 are indeed mandated to install collection/control systems, and should therefore be excluded from this analysis. Further, it is very likely that many of the renewable energy projects simply were unaware of, or missed the deadline for project submittal under the current version of the protocol.

I recommend developing a random sample set of landfills that is large enough to be representative of the 61 landfills shown to be generating RECs, but not offsets, and perform a preliminary survey regarding their decision to not utilize offsets. This may include phone or written interviews with the project owners, site managers, and state regulators. I believe this will demonstrate that many of the projects previously assumed to be additional under the existing protocol are not. It may also identify projects that were otherwise eligible that failed to initiate the submittal process within the required timeframe. **(RSG)**

RESPONSE: Please see the response to Comment #22, as well as the response to Comment #8. The Reserve will consider other options for refining the landfill performance standard in future protocol updates.

3.4.2.2 State and Local Regulations, Ordinances and Permitting Requirements

31. The second paragraph, which begins “For example, on June...” makes reference to California ARB’s adoption of a landfill methane capture strategy in June 2007. This reference is confusing and should be updated, since the date has not been relevant in the Reserve’s application of the landfill protocol in California. It would be more appropriate to reference the date upon which the ARB adopted the regulation, or the date it became law in California, both some years later; or to delete this paragraph altogether as examples are not really necessary to illustrate the point. **[See public comment submission for more detail.] (TerraPass)**

RESPONSE: The language in this section will be updated to make it more relevant and to add clarity.

6.1 Monitoring Requirements

32. Measurements presented in Section 6.1 (page 29) are critical for short and long term data comparability (monitoring of flow, temp and pressure and methane concentration). This section indicates that Equation 5.3 is used for equipment that is internally corrected and Equation 5.2 for measurement requiring correction since the equipment is not corrected. This leaves a question related to the traceability of the measurement – see comments 37, 38, 39, 40, and 41 below. **(ASI)**

RESPONSE: From our experience, it is rare for projects to employ meters that do not internally correct for temperature and pressure. Often these meters correct to a different value than specified in the protocol, but this is corrected mathematically and verified prior to registration. We recognize that this is not an area of zero risk, but we do feel that there is a very low risk of inaccuracy. However, we will follow-up on your comments and may develop new guidance for future protocol updates.

33. With respect to the Landfill Project Protocol, please resolve the difference between the text in section 6.1 on page 29 and the definition of the variable “t” on page 36. On page 29, the phrase “at least daily” implies that more frequent averaging is allowed. However, on page 36, “t” is defined as equal to one day for continuously monitored methane concentration. The two specifications for “t” are not the same.

In a recent verification, this issue came up and the Project Developer produced an e-mail stating that the Reserve had accepted flow-weighted averaging that takes place on a continuous basis (the basis equal to the interval for which methane concentration is monitored). I attach that e-mail. This Project Developer believes that flow-weighted averaging is the most accurate method, yet it is unclear from the protocol whether it is acceptable. Nonetheless, many Project Developers use it instinctively, regardless of what the protocol says.

I recommend that the Reserve explicitly acknowledge the flow-weighted averaging as the preferred method, and redefine “t” so that the definition is the same as the text in Section 6.1. (NSF-ISR)

RESPONSE: It is the Reserve’s intent to allow flow-weighted averaging where continuous measurement is employed. The language in Section 6.1 will be clarified in this regard.

34. In a footnote to Section 6.1, the protocol discusses measurement of landfill gas flow and methane content on wet or dry bases, but does not define these terms. For instance, typically landfill gas flows through a mesh pad demister and is heated as it travels through the blower prior to flow and methane measurement. This removes some free liquid in the gas. In virtually all in-line methane analyzers, additional filtration and/or desiccant drying of only the sampled gas occurs prior to methane measurement to protect the measurement equipment. Portable methane analyzers also have in-line particulate and moisture filters on sample tubes. Additional drying of the total gas stream may occur in some cases as the gas flows through air to air heat exchangers, and air to liquid chilling units. I assume that the protocol refers to “dry” gas as treated gas that has gone through filtration, dewatering, and filtration, and wet gas as not having gone through this process.

I recommend contacting methane analyzer manufacturers such as Landtec, Siemens, and Elkins Earthworks for a better understanding of the filtration and drying required to measure methane. (RSG)

RESPONSE: The intention of this footnote is to specify that if there is a component of the landfill gas system that is removing moisture from the total stream, then the methane and flow meters should be installed in the same position in relation to this component. If there are multiple components of the LFG system that remove moisture from the total stream, then the methane and flow meters should be installed in the same position in relation to all such components (they should be in the same section, without a moisture-removing component separating them). The one acceptable variation to this would be in the case where the flow meter is placed after a moisture-removing component, while the methane analyzer is placed before this component. In this case, the total measurement will be conservative, as the flow readings are lower after the moisture removal, and the methane fraction is lower before the moisture removal. The opposite case is not acceptable. This language will be clarified in the final V4.0.

6.2 Instrument QA/QC

35. In reviewing the current Draft for the Landfill Project Protocol (Public Draft Version 4.0, Dated May 6, 2011), I was taken aback by the proposed changes in Section 6.2 Instrument QA/QC. In particular, striking out language that previously required Cleaning and Inspection on a Quarterly Basis because contamination of the sensor can occur over time, and contamination will definitely effect the reporting accuracy, and hence the validity of the tons of methane that are reported to be destroyed.

I understand that the 2nd bullet of 6.2 is intended to discourage false reporting, requiring a check within 2 months of the reporting period, but the drift described above could occur for months and months, yet not be detected if someone were to simply remove and clean the

sensor prior to the required check. In this scenario, if the sensor were cleaned without performing an “as left/as found” report of inaccuracy or drift, and shortly thereafter, the official required check were conducted, it may appear that the meter has been accurate for the full reporting period, masking a possible over-reporting for many months.

I also understand that Paragraph 2 on page 32 is intended to discourage false reporting due to the retroactive penalty described in the subsequent paragraph. However, as noted earlier, contamination could be corrected (by an actual sensor removal and cleaning) before the calibration is conducted.

I have a great deal of respect for the Climate Action Reserve, and your organization has been devoted to responsible monitoring and controls for the various protocols associated with reducing greenhouse gas emissions for many years. In my opinion, it would be a significant setback if there were to be a change in the protocol that could create untold errors in the reporting process, and hence in the true reduction of GHG emissions. In summary, I make the following suggestions:

- 1) Restore the Quarterly Cleaning and Inspection wording in the first bullet of Section 6.2 (page 31).
- 2) Restore the wording beneath the 3rd bullet of Section 6.2 (page 31)
- 3) Restore footnote 28 on page 31
- 4) Insist on cleaning practices that are Quarterly, unless the manufacturer has a method to conduct an In-Situ verification of cleanliness.

[See public comment submission in-situ verification example, Sage information, and further detail about the proposed changes]. (Sage)

RESPONSE: The Reserve has, over subsequent updates to the landfill protocol, moved towards a risk-based approach to meter QA/QC. We have been increasing the flexibility of the prescribed requirements, while employing conservative adjustments to correct for over- or under-reporting. The goal is to balance QA/QC costs with measurement accuracy. While the prescriptive requirement for documented quarterly cleaning and inspection has been changed, language around this issue has been added and strengthened in other sections. Based on your comment, we do feel that we can further strengthen the language and will do so in the final V4.0.

36. We would like to recommend a potential additional option under Section 6.2 for adjusting metered values for calibrations that indicate over-reporting. In our experience, flow meter factory calibration forms usually present percent difference readings for multiple flow points. With multiple data points, it allows a more complete picture of how inaccurate the flow meter is at different flow ranges. We recommend the option of using a least squares analysis to determine the amount of adjustment for over-reporting flow meters when multiple data points exist from a factory calibration. Statistically speaking, this type of analysis leads to a significantly more accurate representation of the appropriate adjustment needed compared to simply taking the greatest calibration drift that was recorded. **(EM&V)**

RESPONSE: The Reserve strives for both accuracy and conservativeness in its quantification guidance. The guidance to use the greatest calibration drift that was recorded was chosen as the conservative approach in this case. The factory calibration measurements are a snapshot of the meter’s accuracy at a moment in time, and are used to determine the possible inaccuracies over the preceding time period. Because of the

uncertainty involved, and the potential for the testing to result in a range of values, the Reserve has determined that the conservative approach should be followed.

37. Section 6.2 indicates +/- 5% threshold calibration for the field check. What does this mean? How do you calculate a 5% threshold calibration? Does this mean that an external methane reference standard (with a stated uncertainty of less than 1%) is measured and found to be within 5% of the amount calculated from the instrument calibration or within 5% of the measured amount of the unit under test? **(ASI)**

RESPONSE: For field checks, the +/- 5% accuracy threshold for calibration is determined by comparing the reading from the installed meter to the reading provided by the instrument used for the field check (except for methane analyzers that automatically self-calibrate to an internal sample gas). Any portable methane analyzer must be calibrated to a certified sample gas prior to each use. For methane analyzer calibrations, the +/- 5% accuracy threshold will be directly measured with a certified sample gas.

38. Footnote 29 (page 31, "Redline") does not correctly reflect international and national standards for measurement. Measurements must be made by a technically competent calibration laboratory. This is demonstrated by accreditation of a calibration laboratory to ensure traceability of the measurement to the SI or relevant reference material. This traceability of measurement ensures comparison of data between organizations and over time. It also requires the calibration laboratory to appropriately present the precision (repeatability) and bias (reproducibility or sometimes referred to accuracy). These terms are referred to as the total error in some documents. Therefore the QA/QC must be clearly stated to ensure consistent understanding. **(ASI)**

RESPONSE: At this time the Reserve will continue to allow calibration to be carried out by either an accredited calibration laboratory or the original equipment manufacturer. We will follow-up on your comments and may develop new guidance for future protocol updates. Also see response to Comment #39.

39. Footnote 29 indicates a certified calibration laboratory which is not appropriate. An accredited calibration laboratory is the proper term. Some instrument manufacturers have obtained accreditation status as a calibration organization (within last 5 years), but this has not been implemented in all technical disciplines to date. However it is moving in that direction. Equipment manufacturers provide the best service for repair and ensuring equipment performance. However, traceability is sometimes not well documented and they do use consistent terms with other measurement organizations as defined ISO/IEC 17025 (including: Vocabulary of international metrology - VIM ISO 98). **(ASI)**

RESPONSE: In footnote 29 the word "certified" will be changed to "accredited" to reflect this terminology. The Reserve will continue to allow calibration by the original equipment manufacturer.

6.4 Monitoring Parameters

40. Table 6.1: DF - indicates 5% margin of error. How is this calculated? Is this the bias from the continuous meter's value compared to the field measurement unit? Or is this a precision and

bias measurement where a defined number of measurements are made (> 20) and compared to the continuous unit to calculate a margin of error? Is this a relative amount at a 90% or 95% or other confidence interval? The calculation expected should be defined in the definitions. **(ASI)**

RESPONSE: The language in Table 6.1 was unclear. The DF factor is used only where projects did not employ continuous methane monitoring. It is not measured or calculated, but is simply a default factor that depends on the methane monitoring schedule. The language in the table will be clarified to reflect this.

41. Table 6.1 indicates T and P are to be measured but it is not stated what is acceptable performance. It also is not stated as what is done and recorded to ensure the manufacturer's units are measuring temperature and pressure correctly when performed by the manufacturer (e.g. traceability of the measurement, conformance to ISO/IEC 17025, etc.). **(ASI)**

RESPONSE: Please see response to Comment #32.

42. Table 6.1: Requiring a waste-in-place calculation for the beginning of a reporting period imposes a new and supplemental set of calculations to be completed which could require extensive review of base-level records (e.g. scalehouse readings) for the Monitoring Report and for Verification. However, every landfill does submit an annual report to its regulatory agency, which includes waste-in-place data. Requiring a waste-in-place figure to be calculated off-cycle from the regulatory submissions could be quite burdensome. The waste-in-place requirement should allow the annual regulatory report to suffice for quantification of waste-in-place for the reporting period that follows the report. **[See public comment submission for more detail.] (TerraPass)**

RESPONSE: It is reasonable to use an annual regulatory report to suffice for quantification of WIP. The protocol language will be updated to reflect this and provide specific guidance.

7.2 Record Keeping

43. Since the protocol as written excludes projects from selling RECs, we are uncertain why the record keeping list includes REC sale contracts. Should there be a reason to confirm REC sales, contracts are not the only way to demonstrate them and the use of publicly available records such as REC registries should be both allowed and preferred over contract disclosures when they are available. **(TerraPass)**

RESPONSE: Per the response to Comment #22, this recordkeeping requirement will be removed from the final V4.0.

7.3 Reporting Period and Verification Cycle

44. Due to the protocol's size thresholds, small projects may represent a larger percentage of all landfill projects. As such, the annual verification requirement becomes an expensive burden and an unnecessary risk to the project's economics. There are two different circumstances where this would be the case:

(a) *If projects are very small (under 15,000 tons annually).* The protocol is more likely to encourage such projects if the verification cycle can be extended to two years in such cases.

(b) *If projects encounter operational challenges that reduce their verifiable reductions in a reporting period below the point of financial break-even.* It is not obvious what behavior, activities or circumstances the Reserve is trying to prevent or understand by requiring annual verifications without exception, and as such it is difficult to suggest alternatives. However, a requirement to submit contiguous and timely monitoring reports to the Reserve, which can be reviewed in support of the next third-party verification, is one preferable alternative. **(TerraPass)**

RESPONSE: At this time the Reserve does not plan on changing the minimum annual verification cycle for landfill projects. We will consider the possibility of expanding verification cycle options in future protocol updates.