



Mr. R. Sethi
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13th October 2008

Dear Mr. Sethi,

RE: Request for review of the request for issuance for the CDM project activity 'Zámbiza Landfill Gas Project' (Ref. No. 0798)

SGS has been informed that the request for issuance for the CDM project activity 'Zámbiza Landfill Gas Project' (UNFCCC Ref. No. 0798) is under consideration for review because three requests for review have been received from members of the Board.

The requests for review are based on the reasons as outlined below. Through this letter, we would like to provide responses to the issues raised in the requests for review and provide additional information.

Requests for Review 1-3, Issue 1:

The DOE accepted the calculated fraction of methane in LFG during the period of 12-20 March and 30 March to April based on the interpolation from four manual measurements from 13 to 20 March. Further clarification is required how the DOE verified this interpolation in accordance with the methodology

SGS' Response to Issue 1:

The methodology ACM0001 "Consolidated baseline and monitoring methodology for landfill gas project activities", version 4, page 7, states that: "The fraction of methane in the landfill gas (wCH₄,y) should be measured with a continuous analyzer or, alternatively, with periodical measurements, at a 95% confidence level, using calibrated portable gas meters and taking a statistically valid number of samples and accordingly the amount of landfill gas from LFG_{total},y, LFG_{flare},y, LFG_{electricity},y, LFPL,y and LFG_{thermal},y shall be monitored in the same frequency...".

Compliance Regarding Frequency of Records

The equipment used (flow meter, temperature and pressure of gas, methane fraction, flare temperature), monitor project data continuously as established by the methodology and are set up to record data every minute automatically and electronically. This is in line with the methodology, which does not require a specific or minimum periodicity of records. Periodical measurements are taken with a portable gas analyzer by the project operator at least once a week and readings from the equipment panel (flow meter, temperature and pressure of gas, methane fraction, flare temperature) are also taken at the same frequency for cross-checking. This is in line with the methodology, which states that LFG_{total},y, LFG_{flare},y (applicable for the project activity) shall be monitored in the same frequency as the periodical measurements of the fraction of methane and does not require a specific or minimum periodicity of records.

Compliance Regarding 95% Confidence Level

The periodical measurements should be at a 95% confidence level according to the methodology. The analysis was conducted based on the following available information from project participant (Annex 4):

- ✓ Electronic data recorded has been lost on the following periods:

12/03/2007 (15:05) to 20/03/2007 (22:09)
 25/03/2007 (01:59) to 25/03/2007 (02:59)
 30/03/2007 (12:46) to 03/04/2007 (15:33)

- ✓ According to the operator site visit reports verified, periodical measurements were taken within this period in the following days:

13/03/2007 (09:50) – Value of CH₄ (47.2)
 15/03/2007 (10:00) – Value of CH₄ (49.1)
 19/03/2007 (11:00) – Value of CH₄ (45.5)
 20/03/2007 (11:15) – Value of CH₄ (43.6)

Methodology ACM0001 version 4 states that a statistically valid number of samples for the statistic analysis should be taken, however it does not provide a criteria against which the number of samples can be tested to assure it is statistically valid. In June 2008, a Request for Clarification was submitted by SGS regarding this issue (AM_CLA_0095) and responses were addressed by the Meth Panel in the revised methodology. Taking into account guidance from the most recent version of the methodology ACM0001 version 9, it is stated that *“the fraction of methane in the landfill gas (wCH₄,y) can either be measured with a continuous analyzer or, alternatively, conducting periodical measurements with a minimum of four quarterly measurements per year”*. Therefore the four available data from project participant obtained from periodical measurements are considered valid for the analysis, as within a period from 12th March 2007 to 3rd April 2007 (less than 1 year), four records are being used.

In order to analyze the 95% confidence level from this data, the project participant chose to interpolate the periodical measurements with electronic data available, as the frequency of data obtained from periodical measurements (4 data) is different from the set up frequency for the equipment when data is recorded continuously (every minute). As explained by project participant, the linear interpolation has been used to determine fraction of methane during the periods of default of logging these data, which represents the physical behaviour of the gas production of landfill sites in general (Annex 4 Table 1).

The methodology ACM0001 version 4, applied for the project activity, does not require a standard approach for the statistic analysis and from the analysis conducted by project participant SGS verified that the data used was within the 95% of confidence level as explained in the verification report (Annex 2), and as required by the methodology.

In the request for clarification submitted by SGS (AM_CLA_0095) this issue was taken in consideration (*“The methodology does not give guidance on at which frequency should the calculation of confidence interval be conducted”*). The revised methodology ACM0001 version 9 includes the information that *“In case periodical measurements, the lower bound of the 95% confidence interval should be used to estimate baseline methane emissions to ensure conservativeness”*. After receiving the request for review, project participant provided an additional statistic analysis in which the 4 data available is analyzed without interpolation, and the lower bound of the 95% confidence interval is used for the intervals where data is lost, taking into account the guidance on the revised methodology. As explained by project proponent, both mean values for no interpolated data and interpolated data are within the maximum deviation of 5% required by the methodology applied. Considering the lower bound of the 95% confidence interval (-5%), the value obtained for the no interpolated data was 44.03%, while for the continuous logged data with interpolated data was 44.65%. Applying the value of 44.03% according to ACM0001 version 9, total CERs changes to 12,573 tons of CO₂e.

As previously stated in the Monitoring Report (Annex 3, section C.3) and answered by project participant on 9th July 2008 to NIR 09 raised the continuous online monitoring would prevent loss of data in the future but online telephone connection for data transfer takes time to install as it has not been state-of-the-art when plant for this area where the landfill is located so far.

The aforementioned description on the statistic analysis is amended to the Verification Report (Annex 2), also taking in consideration changes in the emission reductions obtained (Annex 3, Annex 5, Annex 6). The spreadsheet including the statistic analysis is attached for the Board consideration (Annex 4).



PP's Response to Issue 1:

The linear interpolation of methane concentration between two values, either manually or automatically measured, has been used to determine fraction of methane during the periods of default of logging these data. The basis for this procedure is the physical behaviour of the gas production of landfill sites in general. Although as stated in the methodology methane content of landfill gas captured can vary by more than 20% during a single day due to gas capture network conditions (dilution with air at wellheads, leakage on pipes, etc.) the concentration of methane in blended landfill gas at the flare respectively at the measurement point in front of the flare is not significantly volatile as long as ambient conditions in general do not change (Annex 4, Table 1). As there was no change of conditions on site or in the landfill body – the landfill is closed and not in operation anymore, no leakages in pipeline system, no additional or less wells during that time – the fraction of methane in landfill gas changes very slowly as it can be verified based on logged data during the rest of the crediting period. Based on that the linear interpolation between to measured values should be reasonable to show fraction of methane for these operation periods.

For additional verification the statistical analysis as required by the methodology ACM0001 was carried out again separately for the four measured values. As the mean value of the four manually measured data (46.35%) is within the maximum deviation of 5% of the continuously logged data (Annex 4) with amended statistical analysis) the manually measured data are considered to be in 95% confidence interval. In addition to this it can be stated that the mean value of both, the manually measured data (46.35%) as well as the combination of manually measured and interpolated data (46.84%), show a standard deviation within the 95% confidence interval and both are below the mean value of the fraction of methane for this period of analysis.

Based on these facts and with reference to ACM0001 version 4 manually recorded data as well as the combination of interpolated and manually measured data meet the requirements of the methodology and therefore it should be reasonable to use these data for further proceedings.

With reference to latest version 9 of ACM0001 incl. the information that in case of periodical measurements the lower bound of the 95% confidence interval should be used to estimate baseline methane emissions to ensure conservativeness for both months, March and April, this procedures is considered in attached xls-files for the according months March and April (Annex 5 and 6) and in the CER spreadsheet version 4 for the crediting period (Annex 3). For the periods of non-recorded methane fraction the lower bound of the 95% confidence interval (44.03%) is used for calculation of CERs. Based on this conservative approach according to ACM0001 version 9 the calculation for March shows a negative difference of 28 tons CO₂e. For April the calculation results in a negative difference to former calculation of 8 tons CO₂e. According to this the total value of CERs change to 12,573 tons CO₂e in CER spreadsheet version 4 (Annex 3).

Although ACM0001 version 4 gives no guidance on proper calculation of CERs in case of periodical measurements of methane fraction - and therefore approach of interpolation was chosen – the approach according to ACM0001 version 9 verifies the chosen approach incl. interpolation as the difference is only marginal (-2.4% in March, -0.6% in April). Finally, this correction of 36 tons CO₂e or 0.29% could be an option to the above mentioned approach incl. interpolation.

Request for Review 1-3, Issue 2:

The DOE accepted 99.99% of flare efficiency analysis conducted on 15 December 2006 at the flare installation and on 4 February 2008 for this monitoring period of March to December 2007. Further clarification is required how the DOE conservatively verified this in accordance with the methodology.

SGS' Response to Issue 2:

The methodology ACM0001 version 4 states that “enclosed flares shall be monitored yearly with the first measurement to be made at the time of installation”, page 9 (5.FE). As clarified in project participants response below, the “yearly measurement” according to methodology and PDD has been interpreted by the technical operator in the way that one measurement of flare efficiency had to be done per year of operation of the flare, as illustrated below:

- ✓ First year of operation: December 2006 – December 2007

Flare analysis conducted on 14/12/2006 (measurement date), right before the start of operation as required by the methodology. Result applied for this period (99.99%).

- ✓ Second year of operation: December 2007 – December 2008

Flare analysis conducted on 14/01/2008 (measurement date), within the period. Result applied for this period (99.99%)

The conservativeness of the flare efficiency conducted is based on the fact that:

1. Both results obtained were exactly the same (99.99%) for the analysis conducted on 14/12/2006 and 14/01/2008 (1 year and a month later);
2. The results for both analysis showed that the flare was operating in a high efficient condition (almost 100%). Also, as explained by project participant, it is unlikely to expect the equipment to work in a lower efficiency in between two events of high efficiency, specially considering no changes in external conditions.

In order to provide the analysis in a way to assure it complies with both calendar and operation calendar SGS has recommended project proponent to conduct this analysis in a calendar basis (one analysis per calendar year), as stated in section 3.2.2 of the verification report (Annex 2). As clarified in the project proponent response the flare efficiency will be conduct within this periodicity for the next monitoring period.

The aforementioned detailed explanation is amended to the Verification Report (Annex 2).

PP's Response to Issue 2:

Regarding measurement of flare efficiency it has to be state that the expression “yearly measurement” according to methodology and PDD has been interpreted by the technical operator in the way that per year of operation of the flare (started in Dec 2006) one measurement has to be done for verification of flare efficiency. According to this understanding the flare efficiency for the first year (Dec 06 to Dec 07) was measured in Dec 2006. For the second year of operation from Dec 07 to Dec 08 we carried out measurement in Jan 08. And so far it was planned to do next measurement for third year of operation (Dec 08 to Dec 09) in early 2009.

As the flare has to be efficient at any time and neither technical equipment has been changed or modified nor ambient conditions have changed an alteration of efficiency of the combustion as recorded during efficiency measurements in Dec 06 and Jan 08 is very unlikely. As there is no other continuous monitoring than the combustion temperature this can be used to prove stable conditions and proper operation of the equipment. The average combustion temperature in December 07 was 973.5°C. Considering the average methane concentration of 39.9% the graph as attached to this email (page 6/8 of Annex 7) shows that the combustion is within the optimal Lambda range of 1.5 to 2.0 with lowest Corg emissions.

Based on the fact that neither hardware nor other external conditions have been changed AND combustion conditions based on recorded temperature have been stable and in optimal range it is very unlikely that the efficiency of the flare has changed for the time between 15.12.07 and 31.12.07 respectively 14.01.08. These explanations should underline the proper operation of the flare with continuous high efficiency at any time. For this reason we apply for the flare efficiency of 99,99% according to the measurement in Dec 06 for the complete crediting period in 2007.

Due to the actual request and for improvement of the verification process we will firstly put in a specific period for the next measurement of flare efficiency in each of the following measurement reports and secondly – as recommended already in the verification report – to avoid any further misunderstandings about measurement schedule we are going to carry out flare efficiency measurements every 12 months.

Request for Review 1-3. Issue 3:

The DOE identified the difference of electricity consumption in between monitoring report and the operator visit report caused by rounding and accepted the lower value. In addition, the monitoring report stated that



the electricity consumption for March was calculated based on the monthly electricity consumption and days for the monitoring period. Further clarification is required how the DOE verified it conservatively.

SGS' Response to Issue 3:

The possible reasons for deviation between the operator site visit report and the data reported in the monitoring report (Annex 1) are clarified in the project participants response below.

As stated in the verification report (Annex 2) the methodology does not specify the periodicity to report the energy consumed (monthly or total for the monitoring period). Both data (recorded monthly or accumulated) represent the "difference of project imports less any imports of electricity in the baseline, to meet the project requirements, in MWh" as required by the methodology. The verification report (Annex 2) also states that, as explained by project participant, as the power consumption is continuously measured and automatically recorded in the power meter the monthly power consumption is calculated based on the first reading of each month. SGS verified the data from the operator site visit report as the main data, obtained on a monthly basis as per project procedure, and used the accumulated data for the whole monitoring period to check any relevant deviation. As stated in the verification report (Annex 2), a difference of 155 kWh was found between the 2 records. The lowest value is accepted as it represents 0,10354 ton CO₂e and is within the equipment accuracy (Annex 8) of 1% (equivalent to 228kWh of the total of recorded during monitoring period, as explained by project participant). Project participant will deduce 1 tonne from final emission reductions in case the explanation given is not satisfactory for the Board, for conservativeness.

For future monitoring periods, in case the difference between the two records is higher than the 1% accepted by the equipment accuracy, SGS recommended project participant to apply the lowest value for conservativeness.

The aforementioned detailed explanation is amended the Verification Report (Annex 2).

PP's Response to Issue 3:

For clarification of the difference between monitoring report and operator visit report it can be stated that the energy consumption is recorded manually. The energy consumption as mentioned in the monitoring report is based on figures from monthly reports according to methodology. As the crediting period started on 8 March 2007 and there was no reading and manually recording at midnight (08.03.2007; 0:00) the energy consumption for the first month was interpolated based on the consumption of the total month. Based on variation of energy consumption according to load conditions of the flare-booster station (gas flow, temperature and pressure of gas) this might be one cause for the deviation between the total amount of energy consumption based on monthly recorded data compared to the cross-check data based on first and final recorded data of the crediting period. Another reason for the deviation could be the rounding of recorded values and the calculation of monthly energy consumption based on first and last reading of each month. While the energy consumption meter records in kWh and the values are recorded in kWh the monthly report shows the figures in MWh with two decimals. This rounding causes another deviation.

Finally it can be state that difference of 155 kWh is within the accuracy of the meter (class 1 accuracy according to Annex 2.08 of the monitoring report; s. page 5.4). The maximum deviation according to accuracy of the measurement equipment could be 1% or equivalent 228 kWh of the total about of recorded energy consumption during crediting period. Choosing the higher value of energy consumption based on cross-check data would result in additional 0,10354 ton CO₂e according to the energy emission factor of 0,668 ton CO₂e/MWh. The deduction of this value from emission reductions as produced by the project could change the final result of Emission Reductions only in one ton CO₂e because of rounding. In case above mentioned explanations for the deviation are not satisfactory we suggest to deduct this 1 ton CO₂e from final result of Emission Reductions.

Request for Review 1-3, Issue 4:

There is an inconsistency of calibration frequency of the LFG flow meter between section B and section C of the monitoring report.



SGS' Response to Issue 4:

As clarified in project participants response below, value was not updated by project participant after receiving the manufacturer's statement. The aforementioned correction is addressed in the revised Monitoring Report (Annex 1).

PP's Response to Issue 4:

As the calibration frequency of the LFG flow meter was changed by manufacturer based on the manufacturer's statement as received and provided this one is the valid procedure to calibrate the equipment. The former information as provided in early 2007 by the manufacturer has not been updated in section C. This oversight has been corrected in the attached doc-file (97 version).

We apologize if the initial verification report was unclear and hope that this letter and the attached documents address the concerns of the Board. If further information is required, Mayra Caradec (mayra.caradec@sgs.com; +507 3170828) will be the contact person for the review process and is available to address questions from the Board during the consideration of the review in case the Executive Board wishes.

Yours sincerely,

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Encl:

- Annex 1: Revised Monitoring Report Version 4
- Annex 2: Revised Verification Report Version 3
- Annex 3: CER Spreadsheet Version 4
- Annex 4: Statistic Analysis Spreadsheet
- Annex 5: Modified data for March 2007
- Annex 6: Modified data for April 2007
- Annex 7: HOFGAS-know-how_05 rev1e
- Annex 8: Documentation for Power Meter Diris Am