



**Verification and certification report form for
CDM project activities
(Version 04.0)**

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION

| | | | |
|---|--|---|----------------------------|
| Title and UNFCCC reference number of the project activity | Brazil NovaGerar Landfill Gas to Energy Project UNFCCC Ref. Number: 0008 | | |
| Scale of the project activity | <input checked="" type="checkbox"/> Large-scale <input type="checkbox"/> Small-scale | | |
| Version number of the verification and certification report | 2.0 | | |
| Completion date of the verification and certification report | 25/11/2021 | | |
| Monitoring period number and duration of this monitoring period | 2 nd Monitoring Period – 3 rd Crediting Period 03/03/2020 to 31/12/2020 (including both days) | | |
| Version number of the monitoring report to which this report applies | 4 | | |
| Crediting period of the project activity corresponding to this monitoring period | Renewable – 7 years Start date: 01/07/2018 | | |
| Project participants | Haztec Tecnologia e Planejamento Ambiental S.A. ALLCOT AG | | |
| Host Party | Brazil | | |
| Applied methodologies and standardized baselines | ACM0001 – Flaring or use of landfill gas – version 19.0 | | |
| Mandatory sectoral scopes | 1 - Energy industries (renewable / non-renewable sources) 13 - Waste handling and disposal | | |
| Conditional sectoral scopes, if applicable | - | | |
| Estimated amount of GHG emission reductions or GHG removals for this monitoring duration in the registered PDD | 517,346 tCO ₂ e | | |
| Certified amount of GHG emission reductions or GHG removals for this monitoring period | Amount before 1 January 2013 | Amount from 1 January 2013 until 31 December 2020 | Amount from 1 January 2021 |
| | - | 490,096 tCO ₂ e | - |
| Name and UNFCCC reference number of the DOE | Earthood Services Private Limited UNFCCC Ref. Number: E-0066 | | |

Name, position and signature of the approver
of the verification and certification report



Dr. Kaviraj Singh
Managing Director

SECTION A. Executive summary

Brief summary of the project activity

The project activity is an LFG collection and flaring system installed at NovaGerar landfill consists of a LFG collecting system, LFG pre-treatment system, flaring system and electricity generation. The landfill gas is collected and through a network composed of transportation pipes, the landfill gas reaches the pre-treatment system in which the moisture is removed and then sent to the flaring system and electricity generation, so reducing the greenhouse gas emissions previously emitted into the atmosphere.

The project activity is located in the city of Nova Iguaçu, State of Rio de Janeiro, Brazil. The GPS coordinates are: 22.666667 S and 43.466667 W.

Scope of verification

Haztec Tecnologia e Planejamento Ambiental S.A. has contracted ESPL to conduct the verification and certification of emission reductions reported for the CDM project activity “Brazil NovaGerar Landfill Gas to Energy Project” for the period from 03/03/2020 to 31/12/2020 (including both days).

The verification is the periodic independent review and ex-post determination of the monitored reductions in GHG emissions that have occurred due to the registered CDM project activity during the defined monitoring period.

The scope of the verification is to establish/verify that:

- the project activity has been implemented and operated as per the registered PDD or any approved revised PDD, and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- the provided monitoring report and other supporting documents are complete, in accordance with the latest applicable version of the completeness checklist for requests for issuance of CERs, verifiable, and in accordance with applicable CDM requirements;
- the actual monitoring system and procedures comply with the monitoring system and procedures described in the monitoring plan, any revised approved monitoring plan, the approved methodology including applicable tool(s) and/or, where applicable, the approved standardized baseline;
- the data are recorded and stored as per the monitoring methodology, including applicable tool(s) and, where applicable, the standardized baseline.

Verification process

The verification process involved the following:

- contract with Haztec Tecnologia e Planejamento Ambiental S.A. for the scope of a verification;
- publication of monitoring report;
- desk review;
- remote on-site inspection;
- issuance of verification findings;
- reporting, calculation checks, QA/QC and resolution of findings;
- issuance of draft verification report;
- independent technical review of the project documentation;
- issuance of the final verification report;
- submission of the request for issuance, as appropriate.

Conclusion

ESPL has performed the verification of the CDM PA “Brazil NovaGerar Landfill Gas to Energy Project”, with UNFCCC Ref. Number 0008, for the monitoring period from 03/03/2020 to 31/12/2020. The verification team has confirmed the implementation of the project as per description in the PDD, the monitoring plan of the PDD and the application of the monitoring methodology (ACM0001 – version 19.0).

In addition, it was confirmed that the monitoring system is in place and the emission reductions are calculated without material misstatements.

The verified emission reductions amount to 490,096 tCO₂e in the above-mentioned monitoring period.

The verification team concluded that the registered CDM PA complies with all relevant CDM procedures/standards/guidance and, therefore, the request for issuance is being submitted in accordance with the CDM procedures.

SECTION B. Verification team, technical reviewer and approver

B.1. Verification team member

| No. | Role | Type of resource | Last name | First name | Affiliation (e.g. name of central or other office of DOE or outsourced entity) | Involvement in | | | |
|-----|-----------------------|------------------|-----------|------------|---|----------------------|--------------------|------------|-----------------------|
| | | | | | | Desk/document review | On-site inspection | Interviews | Verification findings |
| 1. | Team Leader | OR | Cruz | Sergio | Verifit | Y | N | Y | Y |
| 2. | Local Expert | OR | Cruz | Sergio | Verifit | Y | N | Y | Y |
| 3. | Methodological Expert | OR | Cruz | Sergio | Verifit | Y | N | Y | Y |
| 4. | Technical Expert | OR | Cruz | Sergio | Verifit | Y | N | Y | Y |
| 5. | Technical Expert | OR | Sebben | Marcelo | Verifit | Y | N | Y | Y |

B.2. Technical reviewer and approver of the verification and certification report

| No. | Role | Type of resource | Last name | First name | Affiliation (e.g. name of central or other office of DOE or outsourced entity) |
|-----|--------------------|------------------|-----------|------------|---|
| 1. | Technical reviewer | IR | Gautam | Ashok | Central Office |
| 2. | Technical Expert | IR | Gautam | Ashok | Central Office |
| 3. | Approver | IR | Singh | Kaviraj | Central Office |

SECTION C. Application of materiality

C.1. Consideration of materiality in planning the verification

| No. | Risk that could lead to material errors, omissions or misstatements | Assessment of the risk | | Response to the risk in the verification plan and/or sampling plan |
|-----|---|------------------------|---|--|
| | | Risk level | Justification | |
| 1. | Human error in recording the readings | Low | Recording of readings for most of the parameters is automated and electronic and there is limited human intervention. Therefore, chances of possible human errors, in recording and archiving, are minimised. | Electronic records used for ER calculation to be checked with the source data available as plant records. |
| 2. | Error in transferring the data to ER sheet | Medium | Transfer of data from source to ER calculation involve human intervention and might lead to inconsistencies. | The values reported in ER sheet to be checked with their respective source data. The first value, last value and the total of the columns for all parameters reported at the |

| | | | | |
|----|---------------------------------------|------------|---|--|
| | | | | <i>interval of were verified from the source data.</i> |
| 3. | <i>Calculation of some parameters</i> | <i>Low</i> | <i>Human errors entering formulas and data.</i> | <i>All formulas are checked and compared to applied methodology and tools. In addition, entry data are crosschecked with raw data.</i> |

C.2. Consideration of materiality in conducting the verification

In accordance with CDM VVS for project activities – version 03.0 – para. 326, the prescribed threshold for materiality for the project activities are as under:

| Emission Reductions (tCO ₂ e)/year | 500,000 or more | 300,001 to 499,999 | 300,000 or less | Small Scale CDM PAs | Micro Scale CDM PAs |
|---|-----------------|--------------------|-----------------|---------------------|---------------------|
| Materiality threshold (para 326) | 0.5% | 1.0% | 2.0% | 5.0% | 10.0% |

The applicable materiality threshold is 0.5%, as its estimated emissions reductions are more than 500,000 tCO₂/year.

| Particulars / Monitoring Report | MR Version (Public) | MR Version (Revised/Final) |
|---|----------------------------|----------------------------|
| Emission Reductions Achieved (tCO ₂ e) in this monitoring period | 492,769 tCO ₂ e | 490,096 tCO ₂ e |
| Applicable threshold (%) as per para 326 of CDM VVS - version 3.0 | 0.5% | 0.5% |

The verification team has identified the impact of errors observed and those were corrected by PP during verification for all monitoring parameter at individual level. The extrapolated impact on ERs is also provided for parameters individually and in aggregated manner in the end.

| Monitored Parameter (Symbol / Description) | Reporting Frequency | Number of Discrete Data (Total) | Sample selected for verification | Type of error identified | Impact on ERs | |
|---|---------------------|---------------------------------|----------------------------------|---|------------------------|--|
| | | | | | ERs impacted (Sample) | ERs impacted (Population based on extrapolation) |
| $EF_{grid,CM,y}$: Combined margin emission factor | Yearly | 1 (100%) | 1 (100%) | No error | N/A | N/A |
| $EF_{grid,OM,y}$: Operating margin emission factor of the Brazilian grid | Yearly | 1 (100%) | 1 (100%) | No error | N/A | N/A |
| TDL_y : Average technical transmission and distribution losses in the grid in year y for the voltage level at which electricity is obtained from the grid | Yearly | 1 (100%) | 1 (100%) | CAR 02 – Recording error (isolated error) | 9,008 tCO ₂ | N/A |

| | | | | | | |
|--|-----------------------|----------------|--|--|---------------------|-----|
| at the project site | | | | | | |
| $EC_{PJ,y} = EG_{EC1,y}$: Quantity of electricity consumed from the grid by the project activity during the year y | Monthly (3 companies) | 30 (100%) | 30 (100%) | No error | N/A | N/A |
| $NCV_{fuel,y}$: Weighted average net calorific value of fossil fuel i in year y | Yearly | 1 (100%) | 1 (100%) | No error | N/A | N/A |
| $EF_{CO2,Diesel,y}$: Weighted average CO ₂ emission factor of fuel type j in year y | Yearly | 1 (100%) | 1 (100%) | No error | N/A | N/A |
| $FC_{i,j,y}$: Quantity of fossil fuels of type i (Diesel Oil) in process j (diesel generators) during the year y | Monthly | 10 (100%) | 10 (100%) | CAR 03 – Transfer error (isolated error) | 52 tCO ₂ | N/A |
| Management of SWDS | Yearly | 1 (100%) | 1 (100%) | No error | N/A | N/A |
| $EG_{PJ,y} = EC_{BL,k,y}$: Amount of electricity generated using LFG by the project activity in year y | Monthly (2 companies) | 20 (100%) | 20 (100%) | No error | N/A | N/A |
| $O_{pj,h}$: Operation of the equipment that consumes the LFG | Minute | 437,760 (100%) | 384 (0.0877%) – refer to Section D.4 below | No error | N/A | N/A |
| $V_{t,wb}$: Volumetric flow of the gaseous stream in time interval t on a wet basis | Minute | 437,760 (100%) | 384 (0.0877%) – refer to Section D.4 below | No error | N/A | N/A |

| | | | | | | |
|---|--------|----------------|--|----------|-----|-----|
| $V_{i,t,wb}$: Volumetric fraction of greenhouse gas i in a time interval t on a wet basis | Minute | 437,760 (100%) | 384 (0.0877%) – refer to Section D.4 below | No error | N/A | N/A |
| T_t : Temperature of the gaseous stream in time interval t | Minute | 437,760 (100%) | 384 (0.0877%) – refer to Section D.4 below | No error | N/A | N/A |
| P_t : Pressure of the gaseous stream in time interval t | Minute | 437,760 (100%) | 384 (0.0877%) – refer to Section D.4 below | No error | N/A | N/A |
| <i>Status of biogas destruction device:</i> Operational status of biogas destruction devices | - | - | - | No error | N/A | N/A |
| $P_{H_2O,t,Sat}$: Saturation pressure of H ₂ O at temperature T_t in time interval t | - | - | - | No error | N/A | N/A |
| $Flame_m$: Flame detection of flare in the minute m | Minute | 437,760 (100%) | 384 (0.0877%) – refer to Section D.4 below | No error | N/A | N/A |

Based on the above table it can be confirmed that the materiality threshold is not breached applicable for the registered PA as per CDM VVS.

SECTION D. Means of verification

D.1. Desk/document review

A desk review was conducted by the verification team that included:

- a review of the data and information presented to verify its completeness;
- a review of the registered monitoring plan, the monitoring methodology including applicable tool(s) and, where applicable, the applied standardized baseline, paying attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures;
- an evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

A complete list of documents/evidences reviewed is included as Appendix 3.

D.2. On-site inspection

| Duration of on-site inspection: - | | | | |
|-----------------------------------|----------------------------|---------------|------|-------------|
| No. | Activity performed on-site | Site location | Date | Team member |
| - | - | - | - | - |

A site visit was not performed for the verification of the monitoring period, as Brazil is facing the 3rd wave of COVID and it is now the epicentre of the pandemic in the world, with a very difficult situation and very limited conditions for safe travel.

In addition, the PP has an ERPA and an obligation to deliver the issued CERs in 2021. Therefore, a delay in the present verification could lead to severe financial losses for the project owner.

In order to allow a credible and sufficient means for the present validation, the DOE used other standard auditing techniques for validation, as referred to in section 7.1.3 of the VVS-PA, as follows:

- confirmation from PP that no changes occurred in the installed technology, monitoring plan, measuring equipment;
- current pictures of main equipment;
- live/real time video tour;
- document review; and
- interview with PP's representatives (responsible for the management and monitoring of project activity).

Therefore, the PPs have provided all necessary information for a clear and precise understanding of the project activity, which has been considered sufficient by the audit team for the purpose of the present verification.

D.3. Interviews

| No. | Interviewee | | | Date | Subject | Team member |
|-----|------------------------|--------------------|-------------|------------|--|-------------|
| | Last name | First name | Affiliation | | | |
| 1. | Mondini | Jonney | Orizon | 01/06/2021 | Project activity management | Sergio Cruz |
| 2. | Paulino | Ivan | Orizon | 01/06/2021 | Project monitoring | Sergio Cruz |
| 3. | Sprovieri | João | Beng | 01/06/2021 | Project monitoring ER calculations | Sergio Cruz |
| 5. | Veiga | Ana Paula | Beng | 01/06/2021 | CDM aspects ER calculations | Sergio Cruz |
| 6. | Varkulya Jr | Américo | Beng | 01/06/2021 | CDM aspects ER calculations | Sergio Cruz |
| 7. | de Souza de Almeida | Sullivan | AB (Niegar) | 01/06/2021 | Supervision of data of Niegar | Sergio Cruz |
| 8. | Abreu | Carlos Henrique | Niegar | 01/06/2021 | Data of electricity Generation and consumption of Niegar | Sergio Cruz |
| 9. | Aquino | Carlos | Agrekko | 01/06/2021 | Data of electricity Generation and consumption of Agrekko | Sergio Cruz |
| 10. | Barbosa | Nuno | UniCarbo | 03/11/2021 | Efficiency of LFG collection and Incomplete responses | Sergio Cruz |

D.4. Sampling approach

As the supervisory system records the parameters in a 1-minute base, there are 1,440 values per day, per parameter, with a total of 437,760 values in the present monitoring period (304 days) of each parameter.

Applying the following equation, the admissible sampling has been calculated:

$$n \geq \frac{z^2 \times N \times V}{(N - 1) \times \text{precision}^2 + z^2 \times V}$$

Where:

| | |
|-----------|--|
| n | Number of elements to be sampled; |
| N | Total number of elements in the population; |
| p | Proportion: set to 0.5 based on the very conservative estimation that 50% of the values checked are found to be incorrect; |
| z | Constant referring to the level of confidence (for this case 1.96 for 95% as per Guideline for Sampling and Surveys Appendix 1 §113 for large scale project activities); |
| precision | Required precision (for this case 10% = 0.1 as per Guideline for Sampling and Surveys Appendix 1 §9 for SSC project activities and §113 for LSC PA). |

And,

$$V = \frac{p \times (1 - p)}{p^2}$$

Thus, the number of elements that should be sampled was calculated as 384 of each parameter.

Therefore, the verification team has verified randomly the data of 50 recordings per month, which totalized 500 elements of each parameter.

In addition, the aggregated values have been totally checked.

D.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

| Areas of verification findings | No. of CL | No. of CAR | No. of FAR |
|---|-----------|------------|------------|
| Compliance of the monitoring report with the monitoring report form | 1 | - | - |
| Compliance of the project implementation and operation with the registered PDD | 1 | - | - |
| Post-registration changes | - | - | - |
| Compliance of the registered monitoring plan with the methodologies including applicable tools and standardized baselines | - | - | - |
| Compliance of monitoring activities with the registered monitoring plan | 2 | 5 | - |
| Compliance with the calibration frequency requirements for measuring instruments | - | - | - |
| Assessment of data and calculation of emission reductions or net removals | - | 1 | - |
| Assessment of reported sustainable development co-benefits | - | - | - |
| Global stakeholder consultation | - | - | - |
| Others (please specify) | - | - | - |
| Total | 04 | 06 | 0 |

SECTION E. Verification findings

E.1. Compliance of the monitoring report with the monitoring report form

| | |
|------------------------------|--|
| Means of verification | The MR was crosschecked with the CDM-MR-FORM template available at the UNFCCC website and with the instructions for filling it out. |
| Findings | CL 01 |
| Conclusion | The latest version of the verification template (CDM-MR-FORM – version 09.0) available at the UNFCCC website has been used. It has been filled out in accordance with the instructions. |

E.2. Remaining forward action requests from validation and/or previous verifications

Not applicable as there is no remaining FAR from validation of renewal of crediting period or previous verification.

E.3. Compliance of the project implementation and operation with the registered project design document

| | |
|------------------------------|--|
| Means of verification | <p>During the on-site visit, the verification team checked the implementation status of the project activity as well as the monitoring equipment. In addition, interviews with personnel and PP's representatives were also performed.</p> <p>For the present monitoring period, the project activity consisted in capturing the methane resulted from the decomposition of organic waste in NovaGerar Landfill and flaring it and the electricity generation using 12 group generators of 1,411 kW of power (each) – GG1 to GG6 were commissioned on 19/12/2018 and GG7 to GG12 and were commissioned on 21/12/2018, and 04 group generators of 1,250 kW of power (each), commissioned on 01/11/2020.</p> <p>It is important to note that there are three companies involved in the operation of the entire project:</p> <ol style="list-style-type: none"> Orizon (Haztec) is responsible for the LFG collection system, flow monitoring and operation of the flaring system; Niegar is responsible for the operation and monitoring of the 12 engines of 1,411 kW; and Aggreko is responsible for the operation and monitoring of the 04 engines of 1,250 kW. <p>The main equipment used at the project activity during the present monitoring period is given below:</p> <ul style="list-style-type: none"> - 12 group generators GE Jenbacher of 1,411 kW of installed capacity (each); - 04 group generators GE Jenbacher of 1,250 kW of installed capacity (each); - 01 open flare Biotechogas – Model BTG 7500 EF – Serial # BTG 7500 EF-150/16; - 03 blowers Continental Industrie – type 151A.05 – Serial #s 181510013, 191510060 and 171510043; - 01 diesel generator Caterpillar – model GES350 – Serial # 0730912 exchanged by Caterpillar – model C15 – Serial # FTH15369 on 04/09/2020; - 01 flow meter ABB (open flare) – model 266DSH – Serial # 3K646618029790; - 12 flow meters ABB (group generators) – model 266DSH – Serial #s 3K646618004288 (GG1), 3K646618004287 (GG2), 3K646618004283 (GG3), 3K646618008068 (GG4), 3K646618005641 (GG5), 3K646618004284 (GG6), 3K646618004285 (GG7), 3K646618004289 (GG8), 3K646618004294 (GG9), 3K646618004282 (GG10), 3K646618004293 (GG11), and 3K646618004286 (GG12); - 01 residual gas analyser Siemens – model ULTRAMAT 23 – Serial # N1- C7778 exchanged by Serial # N1- F6767 on 21/08/2020; - 01 LFG temperature meter ELSI – Model PT100 – Serial # E19TP0083; - 01 LFG pressure meter ABB – Model 266HSH – Serial # 3K646619004047; - 01 electricity meter Schneider – model PM1200 – Serial # 34152820065 (electricity consumption of Haztec); - 02 electricity meters Schneider – model ION8650 – Serial #s MW-1802B061-02 and MW-1801A681-02 (electricity consumption and generation of Niegar); - 01 electricity meter ELO – model ELO2173 – Serial # 07270201001000095 (electricity consumption and generation of Aggreko). <p>The flow meter Contech – model FT1-06IDDBHCON – Serial # F06393 that monitors the biogas flow used by group generators GG13 to GG16 started operating on 01/01/2021. Thus, after the end of the present monitoring period.</p> <p>In addition, during the remote site visit, it was verified that the two electricity meters (Niegar) have been exchanged by Serial #s MW-2009A325-02 and MW-2008A360-02 on 07/01/2021.</p> |
| Findings | CL 02 |
| Conclusion | <p>According to information verified during the site visit, the verification team could confirm that all physical features (technology, project equipment, and monitoring and metering equipment) of the registered CDM project activity are in place and that the project participants have operated the project activity as per the revised PDD, with the proposed PRCs (refer to Section E.4 below) during the concerned monitoring period.</p> <p>The project activity has been divided in two implementation phases at the PDD:</p> |

| | |
|--|---|
| | <p>a. Phase I: the landfill gas collection is performed connected to a centralized blower system. The destruction of the methane is done by a flare system. This phase has been implemented and it is operational;</p> <p>b. Phase II: implementation of electricity generation system is being performed. 16 group generators are already installed and commissioned. According to the registered PDD, other group generators will be installed in the future in order to conclude this phase.</p> |
|--|---|

E.4. Post-registration changes

E.4.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents¹

A temporary deviation from the monitoring plan is being submitted along with this verification, as for the periods from 01/11/2020 to 31/12/2020, as the flow meter started operating just on 01/01/2021, causing a lack of registration of the biogas flow that was used by group generators 13, 14, 15 and 16 to generate electricity. Nevertheless, as the plant operated normally and the generated electricity by these group generators was correctly registered, a deviation is being requested in order to claim for those emission reductions based on the electricity exported using landfill gas, as a conservative estimate.

Refer to the Validation report for post-registration changes submitted along with this Verification Report.

E.4.2. Corrections

Correction # 1: a Correction is being requested along with this verification as at the time of renewal of crediting period, at Section A.4 of the registered PDD, it was indicated that the Party Switzerland of Project Participant ALLCOT AG wanted to be considered as Project Participant. Nevertheless, this information is incorrect as Party Switzerland does not want to be considered as Project Participant. Thus, the field "Indicate if the Party involved wishes to be considered as project participant" has been corrected as "No".

Correction # 2: a Correction is being requested along with this verification as to correct the parameter "Waste composition", as the gravimetry used at the renewal of the crediting period did not reflect the correct composition of the residues disposed in the landfill.

Refer to the Validation report for post-registration changes that are being requested along with this Verification Report for full assessment.

E.4.3. Changes to the start date of the crediting period

Not applicable, as there is no change in the start date of the crediting period.

E.4.4. Inclusion of a monitoring plan

Not applicable, as monitoring plan is part of the registered PDD.

E.4.5. Permanent changes from registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines or other methodological regulatory documents

Permanent change from registered monitoring plan: a permanent change is being requested as the volumetric fraction of GHG in the waste stream may also be monitored in wet basis. Hence, Option C of TOOL08 – version 03.0 may be used to determine this parameter when the temperature of the gaseous stream is higher than 60°C (333.15 K) at the flow measurement point.

This option was not included in latest version of the registered PDD. Therefore, Option C, when applicable, is to be used to determine the mass flow of the gaseous flow. As a consequence of this inclusion, fixed parameters P_n (Total pressure at normal conditions) and T_n (Temperature at normal conditions) were included, in accordance with requirements of TOOL08.

Refer to the Validation report for post-registration changes that is being presented along with this Verification Report for full assessment.

¹ Other standards, methodologies, methodological tools and guidelines (to be) applied in accordance with the applied(selected) methodologies are collectively referred to as the other (applied) methodological regulatory documents).

E.4.6. Changes to the project design

Change to the project design: a change to the project design is being requested as the LFG collection efficiency has changed from 50% (default value of ACM0001 – version 19.0) to 95%, in accordance with technical specifications of the LFG capture system from LFG implementer (Technical specifications of the biogas collection network – CTR Nova Iguaçu^{31/}).

Refer to the Validation report for post-registration changes that is being presented along with this Verification Report for full assessment.

E.4.7. Changes specific to afforestation and reforestation project activities

Not applicable as it is not an afforestation and reforestation project activity.

E.5. Compliance of the registered monitoring plan with applied methodologies, applied standardized baselines, and other applied methodological regulatory documents

| | |
|------------------------------|--|
| Means of verification | The MP of the approved PDD was reviewed against the monitoring requirements of the applied methodology and applicable tools. |
| Findings | - |
| Conclusion | The MP of the project activity is totally in accordance with the applied methodology ACM0001 – Flaring or use of landfill gas – version 19.0, applicable tools and other regulatory documents. |

E.6. Compliance of monitoring activities with the registered monitoring plan**E.6.1. Data and parameters fixed ex ante or at renewal of crediting period**

| | |
|------------------------------|--|
| Means of verification | <p>All ex-ante parameters listed in MR used to calculate baseline, project, and leakage GHG emissions of the PA were checked against the registered PDD. The ex-ante parameters of the registered PDD were verified to check its consistency with CDM tools and guidance to calculate the ex-ante value and methodological requirements for the baseline, project and leakage emission calculations.</p> <p>The fixed parameters and their values are (as per Section B.6.2 of revised PDD):</p> <ul style="list-style-type: none"> - EF_{grid,BM,2010} (<i>Build margin emission factor of the Brazilian grid</i>): 0.1404 tCO₂/MWh; - OX_{top_layer} (<i>Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline</i>): 0.1; - GWP_{CH4} (<i>Global warming potential of methane</i>): 25 tCO₂e/tCH₄; - R_u (<i>Universal ideal gas constant</i>): 8,314.472 Pa.m³/kmol.K; - P_{ref} (<i>Atmospheric pressure at reference conditions</i>): 101,325 PA; - T_{ref} (<i>Temperature at reference conditions</i>): 273.15 K; - MM_i (<i>Molecular mass of methane</i>): 16.04 kg/kmol; - MM_k (<i>Molecular mass of nitrogen</i>): 28.01 kg/kmol; - MM_{H2O} (<i>Molecular mass of water</i>): 18.0152 kg/kmol; - P_n (<i>Total pressure at normal conditions</i>): 101,325 PA; - T_n (<i>Temperature at normal conditions</i>): 273.15 K. <p>The parameters listed in the registered PDD: <i>Waste composition</i>; η_{PJ}; $\phi_{default}$; <i>OX</i>; <i>F</i>; <i>DOC_{f,default}</i>; <i>f_y</i>; <i>MCF_{default}</i>; <i>DOC_j</i>; and <i>k_j</i> are not being used at this verification.</p> <p>A PRC of a change to the project design is being requested as the LFG collection efficiency has changed from 50% (default value of ACM0001 – version 19.0) to 95%, in accordance with technical specifications of the LFG capture system from LFG implementer (Technical specifications of the biogas collection network – CTR Nova Iguaçu^{31/}). Refer to the Validation report for post-registration changes that is being presented along with this Verification Report for full assessment.</p> |
| Findings | CAR 01; CAR 06 |
| Conclusion | The values in the MR and corresponding emission reduction calculations spreadsheet are consistent with the PDD with requested PRCs. The applied values ex-ante are correct as per the registered and revised PDD. |

E.6.2. Data and parameters monitored

| | |
|------------------------------|---|
| Means of verification | All monitored parameters listed in MR used to calculate baseline, project, and leakage GHG emissions of the PA were checked against the registered PDD. |
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The parameters of the registered PDD were verified in order to check its consistency with CDM tools and guidance to ER calculations.

The monitored parameters and their values are:

1. **$EF_{grid,CM,y}$** : Combined margin emission factor

| Criteria / Requirements | Assessment / Observation |
|---|---|
| Measuring / Reading / Recording frequency | The parameter is annually calculated based on the TOOL07 – version 07.0.0 using the year data published by the Brazilian DNA for values of $EF_{grid,OM}$ and ex-ante $EF_{grid,BM}$. The value of the Combined Margin is: - 2020: 0.2188 tCO ₂ /MWh. |
| Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| Monitoring equipment | N/A |
| Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | N/A |
| Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | N/A |
| Calibration frequency / interval | N/A |
| Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | N/A |
| Is the calibration of measuring equipment carried out by an accredited person or institution? | N/A |
| Is(are) the calibration(s) valid for the entire reporting period? | N/A |
| Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | N/A |
| How were the values in the monitoring report verified? | The values of the MR were verified their consistency with data published by the Brazilian DNA. |
| If applicable, has the reported data been crosschecked with other available data? | N/A |
| Does the data management ensure correct transfer of data and | Data management system was found to be reliable and appropriate. |

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| | reporting of emission reductions and are necessary QA/QC processes in place? | |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A |
| | 2. $EF_{grid,OM,y}$: Operating margin emission factor of the Brazilian grid margin | |
| | Criteria / Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | The parameter is calculated by the Brazilian DNA. The value of the Operating Margin is: - 2020: 0.4539 tCO ₂ /MWh. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| | Monitoring equipment | N/A |
| | Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | N/A |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | N/A |
| | Calibration frequency / interval | N/A |
| | Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | N/A |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | N/A |
| | Is(are) the calibration(s) valid for the entire reporting period? | N/A |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | N/A |
| How were the values in the monitoring report verified? | The values of the MR were verified their consistency with data published by the Brazilian DNA. | |

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| | If applicable, has the reported data been crosschecked with other available data? | N/A |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Data management system was found to be reliable and appropriate. |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A |
| | 3. <i>TDL_y</i> : Average technical transmission and distribution losses in the grid in year y for the voltage level at which electricity is obtained from the grid at the project site | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | It is a default value obtained directly from the Brazilian Energy Balance 2021 – Summary of Final Report (base year 2020), which is an official publication. The value for 2020 is 27.6%. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| | Monitoring equipment | N/A |
| | Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | N/A |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | N/A |
| Calibration frequency / interval | N/A | |
| Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | N/A | |
| Is the calibration of measuring equipment carried out by an accredited person or institution? | N/A | |

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| | Is(are) the calibration(s) valid for the entire reporting period? | N/A |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | N/A |
| | How were the values in the monitoring report verified? | The value of the MR was verified its consistency with Brazilian Energy Balance from 2020. |
| | If applicable, has the reported data been crosschecked with other available data? | N/A |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Data management system was found to be reliable and appropriate. |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A |
| | 4. $EC_{PJ1,y} = EG_{EC1,y}$: Quantity of electricity consumed from the grid by the project activity during the year y | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | The electricity is measured continuously using bidirectional electricity meters. As there were three companies operating the plant during the present monitoring period, each one has its own monitoring. Data is aggregated monthly and yearly. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| Monitoring equipment | <ul style="list-style-type: none"> - 01 electricity meter Schneider – model PM1200 – Serial # 34152820065 (electricity consumption of Haztec); - 02 electricity meters Schneider – model ION8650 – Serial #s MW-1802B061-02 and MW-1801A681-02 (electricity consumption of Niegar); - 01 electricity meter ELO – model ELO2173 – Serial # 9581101 (electricity consumption of Aggreko). | |
| Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | The accuracy of the equipment PM1200 is 1%; ION8650 is 0.2%; and ELO2173 is 0.5%, as per their manuals. | |

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| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | Accuracy is valid for the entire range. |
| | Calibration frequency / interval | The calibration frequency is 5 years, in accordance with Brazilian legislation. The conformity standard of the meters ION8650 is under the electricity distribution company. |
| | Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | N/A |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | N/A |
| | Is(are) the calibration(s) valid for the entire reporting period? | N/A |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | N/A |
| | How were the values in the monitoring report verified? | The values of the MR were verified their consistency with aggregated values of the Excel spreadsheets. |
| | If applicable, has the reported data been crosschecked with other available data? | The values of the MR were reviewed during the site visit by crosschecking the data submitted monthly Excel spreadsheets. The data from meters ION8650 can be checked directly with corresponding CCEE reports (Chamber of Commerce of Electric Energy). The data from meter ELO2173 can be checked with invoices of Light – company responsible for electricity distribution in the State of Rio de Janeiro (Aggreko). |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Data management system was found to be reliable and appropriate. |
| In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A | |
| 5. NCV_{fuel,y} : Weighted average net calorific value of fossil fuel <i>i</i> in year <i>y</i> | | |

| | Criteria/Requirements | Assessment / Observation |
|--|---|---|
| | Measuring / Reading / Recording frequency | <p>It is the weighted average net calorific value of the diesel used at the diesel generators, used on emergency occasions. The value is continuously checked to verify any variation.</p> <p>The value used is the IPCC value of 46.71 GJ/ton. The value is the one for biodiesel, as there is a percentage of biodiesel in the diesel used in the diesel generators. The use of the value of biodiesel is conservative.</p> |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| | Monitoring equipment | N/A |
| | Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | N/A |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | N/A |
| | Calibration frequency / interval | N/A |
| | Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | N/A |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | N/A |
| | Is(are) the calibration(s) valid for the entire reporting period? | N/A |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | N/A |
| | How were the values in the monitoring report verified? | It was verified against IPCC publications. |
| | If applicable, has the reported data been crosschecked with other available data? | N/A |
| | Does the data management ensure correct transfer of data and reporting of emission reductions | Yes. |

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| | and are necessary QA/QC processes in place? | |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A |
| | 6. $EF_{CO_2, Diesel, y}$: Weighted average CO ₂ emission factor of fuel type j in year y | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | It is the weighted average CO ₂ emission factor of diesel used at the diesel generators, used on emergency occasions. The value is continuously checked to verify any variation. The value used is the IPCC value of 0.0843 tCO ₂ /GJ. The value is the one for biodiesel, as there is a percentage of biodiesel in the diesel used in the diesel generators. The use of the value of biodiesel is conservative. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| | Monitoring equipment | N/A |
| | Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | N/A |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | N/A |
| | Calibration frequency / interval | N/A |
| Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | N/A | |
| Is the calibration of measuring equipment carried out by an accredited person or institution? | N/A | |
| Is(are) the calibration(s) valid for the entire reporting period? | N/A | |

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| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | N/A |
| | How were the values in the monitoring report verified? | It was verified against IPCC publications. |
| | If applicable, has the reported data been crosschecked with other available data? | N/A |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes. |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A |
| | 7. $FC_{i,j,y}$: Quantity of fossil fuels of type i (Diesel Oil) in process j (diesel generators) during the year y | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | Quantity of diesel used at the diesel generators, used on emergency occasions. The value is continuously measured. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| | Monitoring equipment | Diesel consumption meter Lupus – model 9644 – Serial # 17081046. |
| Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | The accuracy of the equipment is 0.10%, as per their manuals. | |
| Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | Accuracy is valid for the entire range. | |
| Calibration frequency / interval | 12 months | |
| Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the | The calibration interval is in line with the monitoring plan as it is set as per manufacturer's specifications. | |

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| | local/national standards, or as per the manufacturer's specifications? | |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | An accredited institution has carried out calibration of equipment. |
| | Is(are) the calibration(s) valid for the entire reporting period? | Yes. |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | Yes. |
| | How were the values in the monitoring report verified? | The values of the MR were reviewed by crosschecking the data in submitted monthly Excel spreadsheets directly with corresponding reports. |
| | If applicable, has the reported data been crosschecked with other available data? | Data management system was found to be reliable and appropriate. |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | N/A |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A |

| 8. <i>Management of SWDS</i> | |
|---|--|
| Criteria/Requirements | Assessment / Observation |
| Measuring / Reading / Recording frequency | It is an annual monitoring to ensure that no change in the management of the SWDS after the implementation of the project activity has occurred. |
| Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| Monitoring equipment | N/A |
| Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | N/A |
| Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | N/A |
| Calibration frequency / interval | N/A |

| | Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | N/A | | | | | | | |
|---|--|-----------------------|--------------------------|---|---|---|------|----------------------|---|
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | N/A | | | | | | | |
| | Is(are) the calibration(s) valid for the entire reporting period? | N/A | | | | | | | |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | N/A | | | | | | | |
| | How were the values in the monitoring report verified? | N/A | | | | | | | |
| | If applicable, has the reported data been crosschecked with other available data? | N/A | | | | | | | |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | N/A | | | | | | | |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A | | | | | | | |
| | 9. $EG_{PJ,y} = EC_{BL,k,y}$: Amount of electricity generated using LFG by the project activity in year y | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Criteria/Requirements</th> <th>Assessment / Observation</th> </tr> </thead> <tbody> <tr> <td>Measuring / Reading / Recording frequency</td> <td>The electricity is measured continuously using bidirectional electricity meters. Although there were three companies operating the plant during the present monitoring period, only Niegar and Aggreko have generated electricity. Data is aggregated monthly and yearly.</td> </tr> <tr> <td>Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology?</td> <td>Yes.</td> </tr> <tr> <td>Monitoring equipment</td> <td> <ul style="list-style-type: none"> - 02 electricity meters Schneider – model ION8650 – Serial #s MW-1802B061-02 and MW-1801A681-02 (electricity generation of Niegar); - 01 electricity meter ELO – model ELO2173 – Serial # 9581101 (electricity generation of Aggreko). </td> </tr> </tbody> </table> | Criteria/Requirements | Assessment / Observation | Measuring / Reading / Recording frequency | The electricity is measured continuously using bidirectional electricity meters. Although there were three companies operating the plant during the present monitoring period, only Niegar and Aggreko have generated electricity. Data is aggregated monthly and yearly. | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. | Monitoring equipment | <ul style="list-style-type: none"> - 02 electricity meters Schneider – model ION8650 – Serial #s MW-1802B061-02 and MW-1801A681-02 (electricity generation of Niegar); - 01 electricity meter ELO – model ELO2173 – Serial # 9581101 (electricity generation of Aggreko). |
| Criteria/Requirements | Assessment / Observation | | | | | | | | |
| Measuring / Reading / Recording frequency | The electricity is measured continuously using bidirectional electricity meters. Although there were three companies operating the plant during the present monitoring period, only Niegar and Aggreko have generated electricity. Data is aggregated monthly and yearly. | | | | | | | | |
| Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. | | | | | | | | |
| Monitoring equipment | <ul style="list-style-type: none"> - 02 electricity meters Schneider – model ION8650 – Serial #s MW-1802B061-02 and MW-1801A681-02 (electricity generation of Niegar); - 01 electricity meter ELO – model ELO2173 – Serial # 9581101 (electricity generation of Aggreko). | | | | | | | | |

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| | Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | The accuracy of the equipment ION8650 is 0.2%; and ELO2173 is 0.5%, as per their manuals. |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | Accuracy is valid for the entire range. |
| | Calibration frequency / interval | The calibration frequency is 5 years, in accordance with Brazilian legislation. The conformity standard of the meters is under the electricity distribution company. |
| | Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | N/A |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | N/A |
| | Is(are) the calibration(s) valid for the entire reporting period? | N/A |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | N/A |
| | How were the values in the monitoring report verified? | The values of the MR were verified their consistency with aggregated values of the Excel spreadsheets. |
| | If applicable, has the reported data been crosschecked with other available data? | The values of the MR were reviewed during the site visit by crosschecking the data submitted monthly Excel spreadsheets and checked directly with corresponding CCEE reports (Niegar) and checked with invoices of Light – company responsible for electricity distribution in the State of Rio de Janeiro (Aggreko). |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Data management system was found to be reliable and appropriate. |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of | N/A |

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| | the CDM Project Standard for project activities – version 03.0? | |
| | 10. $O_{pj,h}$: Operation of the equipment that consumes the LFG | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | The parameter is continuously monitored and recorded automatically by supervisory system every minute. The value is either 0 or 1. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| | Monitoring equipment | Device integrated with the operational software at the landfill gas plant. |
| | Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | N/A |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | N/A |
| | Calibration frequency / interval | N/A |
| | Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | N/A |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | N/A |
| | Is(are) the calibration(s) valid for the entire reporting period? | N/A |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | N/A |
| | How were the values in the monitoring report verified? | The values of the MR were verified their consistency with values of the Excel spreadsheets. |
| | If applicable, has the reported data been crosschecked with other available data? | N/A |
| | Does the data management ensure correct transfer of data and reporting of emission reductions | Data management system was found to be reliable and appropriate. |

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| | and are necessary QA/QC processes in place? | |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A |
| | 11. $V_{t,wb}$: Volumetric flow of the gaseous stream in time interval t on a wet basis | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | <p>The flow is continuously monitored by the thermal flow meter.</p> <p>The volumetric flow is considered in wet basis and monitored by supervisory system, as per manufacturer's specification.</p> <p>The flow of the flare is continuously monitored and recorded and hourly aggregated.</p> |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| | Monitoring equipment | <p>- 01 flow meter (open flare) – Serial # 3K646616039104 exchanged by Serial # 3K646618029790 on 08/01/2019;</p> <p>- 12 flow meters (electricity generators) – Serial #s:</p> <ul style="list-style-type: none"> ○ 3K646618004288 (GG1), ○ 3K646618004287 (GG2), ○ 3K646618004283 (GG3), ○ 3K646618008068 (GG4), ○ 3K646618005641 (GG5), ○ 3K646618004284 (GG6), ○ 3K646618004285 (GG7), ○ 3K646618004289 (GG8), ○ 3K646618004294 (GG9), ○ 3K646618004282 (GG10), ○ 3K646618004293 (GG11), ○ 3K646618004286 (GG12). <p>For GG13 to GG16, the flow meter was not in operation during the monitoring period.</p> |
| | Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | The accuracy of the equipment is $\pm 0.06\%$. |
| | Is the accuracy valid for the entire measuring range or do different | Accuracy class is valid for the entire range. |

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| | accuracy levels apply to different measuring ranges? | |
| | Calibration frequency / interval | 04 years |
| | Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | The calibration interval is in line with the monitoring plan as it is set as per manufacturer's specifications. |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | An accredited institution has carried out calibration of equipment. |
| | Is(are) the calibration(s) valid for the entire reporting period? | Yes. |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | Yes. |
| | How were the values in the monitoring report verified? | The values of the MR were verified their consistency with aggregated values of the Excel spreadsheets. |
| | If applicable, has the reported data been crosschecked with other available data? | The values of the MR were reviewed by crosschecking the data in submitted monthly Excel spreadsheets directly with corresponding raw data in reports generated during the remote site visit directly from supervisory system. |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Data management system was found to be reliable and appropriate. |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | A temporary deviation from the monitoring plan is being submitted along with this verification, as for the periods from 01/11/2020 to 31/12/2020, as the flow meter started to operate just on 01/01/2021, causing a lack of registration of the biogas flow that was used by group generators 13, 14, 15 and 16 to generate electricity. Refer to the Validation report for post-registration changes submitted along with this Verification Report. |
| 12. $v_{i,t,wb}$: Volumetric fraction of greenhouse gas i in a time interval t on a wet basis | | |
| Criteria/Requirements | Assessment / Observation | |
| Measuring / Reading / Recording frequency | The parameter is continuously read, measured and recorded every minute automatically by supervisory system and aggregated and reported. For the current monitoring period Option C (in accordance with the PRC proposed along with this verification) was applied for the determination of $F_{CH_4, flared, y}$ | |

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| | $F_{CH_4,EL,y}$ and $F_{CH_4,NG,y}$. The measurement is carried out in wet basis, as per manufacturer's specifications. |
| Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| Monitoring equipment | 01 residual gas analyser Siemens – model ULTRAMAT 23 – Serial # Serial # N1- C7778 exchanged by Serial # N1- F6767 on 21/08/2020. |
| Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | The accuracy of the equipment is $\pm 2\%$ for the CH_4 , as per the manual and in accordance with the registered monitoring plan. |
| Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | Accuracy is valid for the entire range. |
| Calibration frequency / interval | 1 year |
| Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | The calibration interval is in line with the monitoring plan as it is set as per manufacturer's specifications. |
| Is the calibration of measuring equipment carried out by an accredited person or institution? | An accredited institution has carried out calibration of equipment. |
| Is(are) the calibration(s) valid for the entire reporting period? | Yes. |
| Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | Yes. |
| How were the values in the monitoring report verified? | The values of the MR were verified their consistency with aggregated values of the Excel spreadsheets. |
| If applicable, has the reported data been crosschecked with other available data? | The values of the MR were reviewed by crosschecking the data in submitted monthly Excel spreadsheets directly with corresponding raw data in reports generated during the remote site visit directly from supervisory system. |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Data management system was found to be reliable and appropriate. |
| In case project participants have temporarily not monitored the | N/A |

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| | parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | |
| | 13. T_t: Temperature of the gaseous stream in time interval t | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | The temperature is continuously monitored by the temperature sensor. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| | Monitoring equipment | 01 LFG temperature meter ELSI – Model PT100 – Serial # E19TP0083. |
| | Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | The accuracy of the equipment is $\pm 0.1\%$, as per its manual. |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | Accuracy is valid for the entire range. |
| | Calibration frequency / interval | 02 years |
| | Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | The calibration interval is in line with the monitoring plan as it is set as per manufacturer's specifications. |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | An accredited institution has carried out calibration of equipment. |
| | Is(are) the calibration(s) valid for the entire reporting period? | Yes. |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | Yes. |
| | How were the values in the monitoring report verified? | The values of the MR were verified their consistency with aggregated values of the Excel spreadsheets. |
| If applicable, has the reported data been crosschecked with other available data? | The values of the MR were reviewed by crosschecking the data in submitted monthly Excel spreadsheets directly with corresponding raw data in reports generated during the remote site visit directly from supervisory system. | |

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| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Data management system was found to be reliable and appropriate. |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A |
| | 14. P_t: Pressure of the gaseous stream in time interval t | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | The pressure is continuously monitored by LFG pressure meter. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| | Monitoring equipment | 01 LFG pressure meter ABB – Model 266HSH – Serial # 3K646619004047. |
| | Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | The accuracy of the equipment is 0.06%, as per its manual. |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | Accuracy is valid for the entire range. |
| | Calibration frequency / interval | 01 year |
| | Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | The calibration interval is in line with the monitoring plan as it is set as per manufacturer's specifications. |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | An accredited institution has carried out calibration of equipment. |
| | Is(are) the calibration(s) valid for the entire reporting period? | Yes. |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | Yes. |

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| | How were the values in the monitoring report verified? | The values of the MR were verified their consistency with aggregated values of the Excel spreadsheets. |
| | If applicable, has the reported data been crosschecked with other available data? | The values of the MR were reviewed by crosschecking the data in submitted monthly Excel spreadsheets directly with corresponding raw data in reports generated during the remote site visit directly from supervisory system. |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Data management system was found to be reliable and appropriate. |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A |
| | 15. <i>Status of biogas destruction device:</i> Operational status of biogas destruction devices | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | The parameter is continuously monitored and recorded automatically by supervisory system every minute. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| | Monitoring equipment | Flame detector |
| | Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | N/A |
| Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | N/A | |
| Calibration frequency / interval | N/A | |
| Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | N/A | |

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| | Is the calibration of measuring equipment carried out by an accredited person or institution? | N/A |
| | Is(are) the calibration(s) valid for the entire reporting period? | N/A |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | N/A |
| | How were the values in the monitoring report verified? | Interviews and remote site visit. |
| | If applicable, has the reported data been crosschecked with other available data? | N/A |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | N/A |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A |
| | 16. $P_{H_2O,t,Sat}$: Saturation pressure of H₂O at temperature T_t in time interval t | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | This parameter is solely a function of the gaseous stream temperature T_t and can be found at reference for a total pressure equal to 101,325 Pa. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | N/A |
| | Monitoring equipment | N/A |
| | Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | N/A |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | N/A |
| | Calibration frequency / interval | N/A |
| Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of | N/A | |

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| | calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | N/A |
| | Is(are) the calibration(s) valid for the entire reporting period? | N/A |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | N/A |
| | How were the values in the monitoring report verified? | N/A |
| | If applicable, has the reported data been crosschecked with other available data? | N/A |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | N/A |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A |
| | 17. <i>Flame_m</i>: Flame detection of flare in the minute <i>m</i> | |
| | Criteria/Requirements | Assessment / Observation |
| Measuring / Reading / Recording frequency | The parameter is continuously monitored and recorded automatically by supervisory system every minute, if the flame is on; otherwise it is off. | |
| Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. | |
| Monitoring equipment | Ultraviolet flame detector. | |
| Is the accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | N/A | |
| Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | N/A | |
| Calibration frequency / interval | N/A | |

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| | Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | N/A |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | N/A |
| | Is(are) the calibration(s) valid for the entire reporting period? | N/A |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | N/A |
| | How were the values in the monitoring report verified? | The values of the MR were verified their consistency with values of the Excel spreadsheets. |
| | If applicable, has the reported data been crosschecked with other available data? | N/A |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Data management system was found to be reliable and appropriate. |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by paragraph 231 of the CDM Project Standard for project activities – version 03.0? | N/A |
| | <p>The following parameters have not been used during the present monitoring period, as the monitoring is done on wet basis and no enclosed flare is used:</p> <ul style="list-style-type: none"> - Maintenance_y: Maintenance events completed in year <i>y</i>; - V_{i,t,db}: Volumetric fraction of greenhouse gas <i>i</i> in a time interval <i>t</i> on a dry basis; - V_{t,db}: Volumetric flow of the gaseous stream in time interval <i>t</i> on a dry basis. <p>During the monitoring period, there were several events due to maintenance and/or technical problems, which may have interrupted the operation of the project activity. During those events, the emission may not be claimed. At Section B.1 of the MR, just the events of more than 01 hour have been described.</p> | |
| Findings | CL 03; CL 04; CAR 02; CAR 03; CAR 04 | |
| Conclusion | <p>The monitoring plan has been properly implemented and followed by the project participants, in accordance with revised PDD.</p> <p>In addition, the parameters have been monitored in a correct and conservative way.</p> <p>The CER calculation spreadsheets present the parameters and calculations on a minute basis.</p> <p>Quality assurance and quality control procedures are in place.</p> | |

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| | It is important to note that it is being requested, along with this verification, a PRC in order to include Option C of TOOL08 – version 03.0 to monitor the volumetric fraction of GHG in the waste stream in wet basis. Therefore, the verification team has concluded that the monitoring of the project activity is in accordance with the revised proposed monitoring plan. |
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E.6.3. Implementation of sampling plan

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| Means of verification | Documents were checked and interviews with PP's representatives and personnel were performed in order check if a sampling plan was used. |
| Findings | - |
| Conclusion | Not applicable as no sampling plan was used. |

E.7. Compliance with the calibration frequency requirements for measuring instruments

| Means of verification | Manuals of equipment, national regulations registered monitoring plan and calibration certificates were checked in order to verify the compliance and frequency of the calibrations/inspections requirements of measuring equipment. The calibration certificates are listed below: | | | | | | | | | |
|--|---|-------------------------------------|------------------------------------|-----------------------------|---|-------------------------------------|--|--|--------------------------------------|--|
| | <table><tr><th>Instrument – Manufacturer / Issuer</th><th>Date of issuance / validity</th></tr><tr><td>1. <u>Thermal Flow Meter</u> (open flare) - Serial # 3K646618029790 o Certificate # P-0898/20 – CTJ</td><td>27/01/2020 – valid until 26/01/2024</td></tr><tr><td>2. <u>Thermal Flow Meter</u> (group generators) - GG1 – Serial # 3K646618004288 o Certificate # 1000867578 – ABB - GG2 – Serial # 3K646618004287 o Certificate # 1000867577 – ABB - GG3 – Serial # 3K646618004283 o Certificate # 1000867573 – ABB - GG4 – Serial # 3K646618008068 o Certificate # 1000873758 – ABB - GG5 – Serial # 3K646618005641 o Certificate # 1000869811 – ABB - GG6 – Serial # 3K646618004284 o Certificate # 1000867574 – ABB - GG7 – Serial # 3K646618004285 o Certificate # 1000867575 – ABB - GG8 – Serial # 3K646618004289 o Certificate # 1000867579 – ABB - GG9 – Serial # 3K646618004294 o Certificate # 1000867582 – ABB - GG10 – Serial # 3K646618004282 o Certificate # 1000867572 – ABB - GG11 – Serial # 3K646618004293 o Certificate # 1000867581 – ABB - GG12 – Serial # 3K646618004286 o Certificate # 1000867576 – ABB</td><td>15/02/2018 – valid until 14/02/2022 14/02/2018 – valid until 13/02/2022 15/02/2018 – valid until 14/02/2022 19/03/2018 – valid until 18/03/2022 26/02/2018 – valid until 25/02/2022 15/02/2018 – valid until 14/02/2022 16/02/2018 – valid until 15/02/2022 15/02/2018 – valid until 14/02/2022 15/02/2018 – valid until 14/02/2022 20/02/2018 – valid until 19/02/2022 15/02/2018 – valid until 14/02/2022 20/02/2018 – valid until 19/02/2022</td></tr><tr><td>3. <u>Gas Analyser</u> (ULTRAMAT 23)</td><td></td></tr></table> | | Instrument – Manufacturer / Issuer | Date of issuance / validity | 1. <u>Thermal Flow Meter</u> (open flare) - Serial # 3K646618029790 o Certificate # P-0898/20 – CTJ | 27/01/2020 – valid until 26/01/2024 | 2. <u>Thermal Flow Meter</u> (group generators) - GG1 – Serial # 3K646618004288 o Certificate # 1000867578 – ABB - GG2 – Serial # 3K646618004287 o Certificate # 1000867577 – ABB - GG3 – Serial # 3K646618004283 o Certificate # 1000867573 – ABB - GG4 – Serial # 3K646618008068 o Certificate # 1000873758 – ABB - GG5 – Serial # 3K646618005641 o Certificate # 1000869811 – ABB - GG6 – Serial # 3K646618004284 o Certificate # 1000867574 – ABB - GG7 – Serial # 3K646618004285 o Certificate # 1000867575 – ABB - GG8 – Serial # 3K646618004289 o Certificate # 1000867579 – ABB - GG9 – Serial # 3K646618004294 o Certificate # 1000867582 – ABB - GG10 – Serial # 3K646618004282 o Certificate # 1000867572 – ABB - GG11 – Serial # 3K646618004293 o Certificate # 1000867581 – ABB - GG12 – Serial # 3K646618004286 o Certificate # 1000867576 – ABB | 15/02/2018 – valid until 14/02/2022 14/02/2018 – valid until 13/02/2022 15/02/2018 – valid until 14/02/2022 19/03/2018 – valid until 18/03/2022 26/02/2018 – valid until 25/02/2022 15/02/2018 – valid until 14/02/2022 16/02/2018 – valid until 15/02/2022 15/02/2018 – valid until 14/02/2022 15/02/2018 – valid until 14/02/2022 20/02/2018 – valid until 19/02/2022 15/02/2018 – valid until 14/02/2022 20/02/2018 – valid until 19/02/2022 | 3. <u>Gas Analyser</u> (ULTRAMAT 23) | |
| | Instrument – Manufacturer / Issuer | Date of issuance / validity | | | | | | | | |
| | 1. <u>Thermal Flow Meter</u> (open flare) - Serial # 3K646618029790 o Certificate # P-0898/20 – CTJ | 27/01/2020 – valid until 26/01/2024 | | | | | | | | |
| 2. <u>Thermal Flow Meter</u> (group generators) - GG1 – Serial # 3K646618004288 o Certificate # 1000867578 – ABB - GG2 – Serial # 3K646618004287 o Certificate # 1000867577 – ABB - GG3 – Serial # 3K646618004283 o Certificate # 1000867573 – ABB - GG4 – Serial # 3K646618008068 o Certificate # 1000873758 – ABB - GG5 – Serial # 3K646618005641 o Certificate # 1000869811 – ABB - GG6 – Serial # 3K646618004284 o Certificate # 1000867574 – ABB - GG7 – Serial # 3K646618004285 o Certificate # 1000867575 – ABB - GG8 – Serial # 3K646618004289 o Certificate # 1000867579 – ABB - GG9 – Serial # 3K646618004294 o Certificate # 1000867582 – ABB - GG10 – Serial # 3K646618004282 o Certificate # 1000867572 – ABB - GG11 – Serial # 3K646618004293 o Certificate # 1000867581 – ABB - GG12 – Serial # 3K646618004286 o Certificate # 1000867576 – ABB | 15/02/2018 – valid until 14/02/2022 14/02/2018 – valid until 13/02/2022 15/02/2018 – valid until 14/02/2022 19/03/2018 – valid until 18/03/2022 26/02/2018 – valid until 25/02/2022 15/02/2018 – valid until 14/02/2022 16/02/2018 – valid until 15/02/2022 15/02/2018 – valid until 14/02/2022 15/02/2018 – valid until 14/02/2022 20/02/2018 – valid until 19/02/2022 15/02/2018 – valid until 14/02/2022 20/02/2018 – valid until 19/02/2022 | | | | | | | | | |
| 3. <u>Gas Analyser</u> (ULTRAMAT 23) | | | | | | | | | | |
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| | <ul style="list-style-type: none">- Serial # N1- C7778<ul style="list-style-type: none">o Certificate # 119.0/2019 – Isocello Certificate # 1953-2/20 – Aselco- Serial # N1- F6767<ul style="list-style-type: none">o Certificate # 1953-1/20 – Aselco | 16/04/2019 – valid until 15/04/2020 18/03/2020 – valid until 17/03/2021 18/03/2020 – valid until 17/03/2021 | | | | | | | | | | | | | |
|--|---|---|------------------------------------|------------------|--|------------|-----------------------------------|--------------|--|------------|-------------------------------------|------------|---|------------|--|
| | 4. <u>Pressure meter</u> <ul style="list-style-type: none">- Serial 3K646619004047<ul style="list-style-type: none">o Certificate # P-0901/20 – CTJ | 27/01/2020 – valid until 26/01/2021 | | | | | | | | | | | | | |
| | 5. <u>Temperature meter</u> <ul style="list-style-type: none">- Serial # E19TP0083<ul style="list-style-type: none">o Certificate # T-0787/20 – CTJ | 29/01/2020 – valid until 28/01/2022 | | | | | | | | | | | | | |
| | 6. <u>Electricity Meter</u> <ul style="list-style-type: none">- Serial # MW-1802B061-02 – Schneider ION8650<ul style="list-style-type: none">o Meter Configuration Report – Supervisory System- Serial # MW-1801A681-02 – Schneider ION8650<ul style="list-style-type: none">o Meter Configuration Report – Supervisory System- Serial # 34152820065 – Schneider PM1200<ul style="list-style-type: none">o Test and Calibration Certificate – Schneider Electrico Calibration certificate # E-1349/20 – CTJ- Serial # 9581101 – ELO2173<ul style="list-style-type: none">o Meter Configuration Report – Light | 05/02/2019 – valid until 04/02/2024 05/02/2019 – valid until 04/02/2024 07/07/2015 – valid until 06/07/2020 22/06/2020 – valid until 21/06/2025 20/10/2020 – valid until 19/10/2025 | | | | | | | | | | | | | |
| | 7. <u>Diesel consumption meter</u> <ul style="list-style-type: none">- Serial # 17081046<ul style="list-style-type: none">o Certificate # 126/2019 – JRFo Certificate # 051/2020 – JRF | 08/11/2019 – valid until 07/11/2020 04/11/2020 – valid until 03/11/2021 | | | | | | | | | | | | | |
| | The <u>manufacturer's specifications for calibrations</u> are listed below: | | | | | | | | | | | | | | |
| | <table><tr><th>Instrument – Manufacturer / Issuer</th><th>Date of issuance</th></tr><tr><td>Thermal Flow meter: 4 years – Biotechnogas</td><td>24/05/2016</td></tr><tr><td>Gas Analyser: 12 months – Siemens</td><td>January/2015</td></tr><tr><td>Pressure meter: 12 months – Biotechnogas</td><td>24/05/2016</td></tr><tr><td>Temperature meter: 24 months – ELSI</td><td>23/02/2010</td></tr><tr><td>Electricity meter: 5 years – ONS – Submodule 12.3</td><td>01/01/2017</td></tr><tr><td>Diesel consumption meter: 01 year – JRF's Calibration certificates</td><td>-</td></tr></table> | | Instrument – Manufacturer / Issuer | Date of issuance | Thermal Flow meter: 4 years – Biotechnogas | 24/05/2016 | Gas Analyser: 12 months – Siemens | January/2015 | Pressure meter: 12 months – Biotechnogas | 24/05/2016 | Temperature meter: 24 months – ELSI | 23/02/2010 | Electricity meter: 5 years – ONS – Submodule 12.3 | 01/01/2017 | Diesel consumption meter: 01 year – JRF's Calibration certificates |
| Instrument – Manufacturer / Issuer | Date of issuance | | | | | | | | | | | | | | |
| Thermal Flow meter: 4 years – Biotechnogas | 24/05/2016 | | | | | | | | | | | | | | |
| Gas Analyser: 12 months – Siemens | January/2015 | | | | | | | | | | | | | | |
| Pressure meter: 12 months – Biotechnogas | 24/05/2016 | | | | | | | | | | | | | | |
| Temperature meter: 24 months – ELSI | 23/02/2010 | | | | | | | | | | | | | | |
| Electricity meter: 5 years – ONS – Submodule 12.3 | 01/01/2017 | | | | | | | | | | | | | | |
| Diesel consumption meter: 01 year – JRF's Calibration certificates | - | | | | | | | | | | | | | | |
| Findings | - | | | | | | | | | | | | | | |
| Conclusion | All measuring equipment have been duly calibrated for the complete monitoring period. | | | | | | | | | | | | | | |

E.8. Assessment of data and calculation of emission reductions or net removals

E.8.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

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| Means of verification | <p>The calculations of baseline emission have been done in accordance with registered monitoring plan and applied methodology. The equation used is as follows:</p> $BE_y = BE_{CH_4,y} + BE_{EC,y}$ <p>Where:</p> <ul style="list-style-type: none"> - BE_y: Baseline emissions in year y; - $BE_{CH_4,y}$: Baseline emissions of methane from the SWDS; - $BE_{EC,y}$: Baseline emissions associated with electricity generation. <p>The baseline emissions are calculated using the following equations:</p> <p>$BE_{CH_4,y} = ((1 - OX_{top_layer}) \times F_{CH_4,PJ,y} - F_{CH_4,BL,y}) \times GWP_{CH_4}$, where:</p> <ul style="list-style-type: none"> - $BE_{CH_4,y}$: Baseline emissions of methane from the SWDS, in year y; - OX_{top_layer}: Fraction of methane that would be oxidized in the top layer of the baseline; - $F_{CH_4,PJ,y}$: Amount of methane in the LFG which is flared and/or used in the project, in year y; - $F_{CH_4,BL,y}$: Amount of methane in the LFG that would be flared in the baseline in year y; - GWP_{CH_4}: Global warming potential value of methane. <p>$BE_{EC,y} = EC_{BL} \times EF_{grid,CM} \times (1 + TDL_y)$, where:</p> <ul style="list-style-type: none"> - $BE_{EC,y}$: Baseline emissions associated with electricity generation; - EC_{BL}: Net amount of electricity generated using LFG in year y; - $EF_{grid,CM}$: Emission factor for electricity generation in year y; - TDL_y: Average technical transmission and distribution losses for providing electricity in year y. <p>$BE_y = 490,615 \text{ tCO}_2\text{e}$</p> |
| Findings | - |
| Conclusion | <p>The verification team confirms that:</p> <ol style="list-style-type: none"> the monitored data was available in accordance with the registered monitoring plan; the reported data were crosschecked, as prescribed in the revised approved PDD, with the relevant supporting and were found consistent; appropriate methods and formulae for calculating baseline GHG emissions have been followed; the assumptions, emission factors and default values that were applied in the calculations are correct and evidenced; the calculations are transparent, consistent, correct and complete. |

E.8.2. Calculation of project GHG emissions or actual net anthropogenic GHG removals by sinks

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| Means of verification | <p>Project emission calculations have been done in accordance with registered monitoring plan, applied methodology and tool. The equation used is as follows:</p> $PE_y = PE_{EC,y} + PE_{FC,j,y}$ <p>Where:</p> <ul style="list-style-type: none"> - PE_y: Project emissions in year y; - $PE_{EC,y}$: Emissions from consumption of electricity due to the project activity, in year y; - $PE_{FC,j,y}$: Emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, in year y. <p>The project emissions are calculated using the following equations:</p> <p>$PE_{EC1,y} = EC_{PJ1,y} \times EF_{grid,CM,y} \times (1 + TDL_y)$, where:</p> <ul style="list-style-type: none"> - $PE_{EC1,y}$: Project emissions from electricity consumption from the grid; |
|------------------------------|--|

| | |
|-------------------|---|
| | <ul style="list-style-type: none"> - $EC_{PJ1,y}$: Quantity of electricity consumed from the grid by the project activity, in year y; - $EF_{grid,CM,y}$ = Emission factor for the grid in year y; - TDL_y = Average technical transmission and distribution losses in the grid in year y for the voltage level at which electricity is obtained from the grid at the project site. <p>$PE_{FC,j,y} = FC_{i,j,y} \times COEF_{i,y}$, where:</p> <ul style="list-style-type: none"> - $PE_{FC,j,y}$: Emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, in year y; - $FC_{i,j,y}$: Quantity of fossil fuel i (diesel oil) combusted in process j (diesel generator) during year y; - $COEF_{i,y}$: CO₂ emission coefficient of the diesel oil. <p>$PE_y = 519 \text{ tCO}_2\text{e}$</p> |
| Findings | CAR 02; CAR 03 |
| Conclusion | <p>The verification team confirms that:</p> <ol style="list-style-type: none"> the monitored data was available in accordance with the registered monitoring plan; the reported data were crosschecked, as prescribed in the revised approved PDD, with the relevant supporting and were found consistent; appropriate methods and formulae for calculating baseline GHG emissions have been followed; the assumptions, emission factors and default values that were applied in the calculations are correct and evidenced; the calculations are transparent, consistent, correct and complete. |

E.8.3. Calculation of leakage GHG emissions

| | |
|------------------------------|--|
| Means of verification | <p>No leakage emissions are to be considered, as per the applied methodology.</p> <p>$LE_y = 0 \text{ tCO}_2\text{e}$</p> |
| Findings | - |
| Conclusion | <p>The verification team confirms that:</p> <ol style="list-style-type: none"> the monitored data was available in accordance with the registered monitoring plan; the reported data were crosschecked, as prescribed in the revised approved PDD, with the relevant supporting and were found consistent; appropriate methods and formulae for calculating baseline GHG emissions have been followed; the assumptions, emission factors and default values that were applied in the calculations are correct and evidenced. |

E.8.4. Summary calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

| | |
|------------------------------|---|
| Means of verification | <p>The emission reductions from the project activity are based on baseline and project emissions only.</p> <p>The calculations presented at the final MR and corresponding ER calculation spreadsheet were found to be appropriate and in compliance with the provisions of the registered monitoring plan of the approved PDD and applied methodology. The verification team confirms an audit trail that contains the evidences and records of validated figures.</p> |
| Findings | CAR 02; CAR 03 |
| Conclusion | <p>The verification team confirms that appropriate methods and formulae for calculating baseline GHG emissions reductions have been followed.</p> <p>The summary table has been correctly presented at the MR and the figures are correct and justified.</p> |

E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

| | |
|------------------------------|--|
| Means of verification | The actual emission reductions (490,096 tCO ₂) were checked against the estimates of the revised PDD (517,346 tCO ₂). The actual values are about 6% lower than the estimated at the revised PDD. |
| Findings | - |
| Conclusion | The comparison of actual values of the monitoring period with the estimates in the revised PDD is properly presented at the MR. |

E.8.6. Remarks on difference from estimated value in registered PDD

| | |
|------------------------------|--|
| Means of verification | As there was a significant increase in the achieved ERs in comparison to the estimates done at the renewal of the crediting period, the PP is requesting a Correction of the gravimetry of the waste, as the parameter was incorrectly set at the renewal of the crediting period. In addition, a Change to the project design is being requested as the LFG collection efficiency has changed from 50% (default value of ACM0001 – version 19.0) to 95%, in accordance with technical specifications of the LFG capture system from LFG implementer (Technical specifications of the biogas collection network – CTR Nova Iguaçu ^{31/}). Refer to the Validation Report for PRCs that is submitted along with this Verification Report. |
| Findings | CAR 05 |
| Conclusion | As per the revised PDD estimates (with corrected gravimetry of the waste and efficiency of the collection system), the values achieved are 6% lower than estimated ERs and there is no need for further explanation. |

E.8.7. Actual GHG emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

| Means of verification | ESPL is able to certify that the emission reductions from the CDM project activity “Brazil NovaGerar Landfill Gas to Energy Project” – Ref. 0008 for the monitoring period from 03/03/2020 to 31/12/2020 (including both days). Verified and certified emission reductions as per commitment period: <table border="1"> <thead> <tr> <th>Commitment period</th><th>Amount</th></tr> </thead> <tbody> <tr> <td>Up to 31/12/2012</td><td>0 tCO₂e</td></tr> <tr> <td>From 01/01/2013 until 31/12/2020</td><td>490,096 tCO₂</td></tr> <tr> <td>From 01/01/2021</td><td>0 tCO₂e</td></tr> </tbody> </table> | Commitment period | Amount | Up to 31/12/2012 | 0 tCO ₂ e | From 01/01/2013 until 31/12/2020 | 490,096 tCO ₂ | From 01/01/2021 | 0 tCO ₂ e |
|----------------------------------|---|-------------------|--------|------------------|----------------------|----------------------------------|--------------------------|-----------------|----------------------|
| Commitment period | Amount | | | | | | | | |
| Up to 31/12/2012 | 0 tCO ₂ e | | | | | | | | |
| From 01/01/2013 until 31/12/2020 | 490,096 tCO ₂ | | | | | | | | |
| From 01/01/2021 | 0 tCO ₂ e | | | | | | | | |
| Findings | - | | | | | | | | |
| Conclusion | The total amount of GHG emissions reductions have been generated from 01/01/2013 until 31/12/2020. | | | | | | | | |

E.9. Assessment of reported sustainable development co-benefits

| | |
|------------------------------|---|
| Means of verification | The project participants have not monitored sustainable development co-benefits of the registered CDM project activity. |
| Findings | - |
| Conclusion | Not applicable. |

E.10. Global stakeholder consultation

| | |
|------------------------------|--|
| Means of verification | The MR has been made public available at UNFCCC website on 07/05/2021. No comments have been received. |
| Findings | - |
| Conclusion | No comments were received after the publication of the MR for global stakeholder consultation. |

SECTION F. Internal quality control

The draft verification report that is prepared by verification team is reviewed by an independent technical review team (one or more members) to confirm if the internal procedures established and implemented by ESPL were

duly complied with and such opinion/conclusion is reached in an objective manner that complies with the applicable CDM rules/requirements.

The technical review team is collectively required to possess the technical expertise of all the technical area/sectoral scope to which the project activity is related. All members of technical review team are independent of the verification team.

During the technical review process, additional findings may be identified or the closed-out findings may be opened, which needs to be satisfactorily resolved before the request for issuance is submitted to UNFCCC. The independent technical reviewer may either approve the report as such or reject/return the same in such case providing the comments/findings/issues that needs to be resolved by the verification team. The decision taken by the technical reviewer is final and is authorized on behalf of ESPL.

SECTION G. Verification opinion

ESPL, contracted by Haztec Tecnologia e Planejamento Ambiental S.A., has performed the independent verification of the emission reductions for the CDM project activity “Brazil NovaGerar Landfill Gas to Energy Project” – Ref.: 0008 – in Brazil, for the monitoring period from 03/03/2020 to 31/12/2020 (including both days) as reported in the draft Monitoring Report.

BENG Engenharia is responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project activity.

ESPL commenced the verification based on the baseline and monitoring methodology ACM0001 – version 19.0, the monitoring plan contained in the registered PDD and draft Monitoring Report.

ESPL’s verification approach is based on the understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. ESPL planned and performed the verification by obtaining evidence and other information and explanations that ESPL considered necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

The verification team confirms that:

- the project activity was found implemented as per the description given in the registered PDD; and
- the actual operation is in conformance with the description in the registered PDD.

SECTION H. Certification statement

ESPL, contracted by Haztec Tecnologia e Planejamento Ambiental S.A., has performed the independent verification of the emission reductions for the CDM project activity “Brazil NovaGerar Landfill Gas to Energy Project” – Ref.: 0008 – in Brazil for the monitoring period from 03/03/2020 to 31/12/2020 (including both days), as reported in the final version of the Monitoring Report.

It is our responsibility to express an independent verification statement on the reported GHG emission reductions from the project activity.

In our opinion, the GHG emissions reductions reported for the project activity for the monitoring period are fairly stated in the final version of the Monitoring Report. The GHG emission reductions were correctly calculated based on the approved baseline and monitoring methodology ACM0001 – version 19.0 and the monitoring plan contained in the PDD.

ESPL is able to certify that the emission reductions of CDM project activity “Brazil NovaGerar Landfill Gas to Energy Project”, during the present monitoring period, totalize the amount of **490,096 tCO₂e**.

Appendix 1. Abbreviations

| Abbreviations | Full texts |
|--------------------|---|
| ACM | Approved Consolidated Methodology |
| BE | Baseline Emissions |
| BM | Build Margin |
| CAR | Corrective Action Request |
| CCEE | Chamber of Commerce of Electric Energy |
| CDM | Clean Development Mechanism |
| CH ₄ | Methane |
| CL | Clarification Request |
| CM | Combined Margin |
| CO ₂ | Carbon dioxide |
| CO ₂ e | Carbon dioxide equivalent |
| CP | Crediting Period |
| DNA | Designated National Authority |
| DOE | Designated Operational Entity |
| EB | Executive Board |
| EIA | Environmental Impact Assessment |
| ESPL | Earthood Services Private Limited |
| FAR | Forward Action Request |
| GG | Electricity Generation Group |
| GHG | Green House Gas |
| GSC/GSP | Global Stakeholder Consultation Process |
| INEA | Institute of the Environment of the State of Rio de Janeiro |
| IPCC | Intergovernmental Panel on Climate Change |
| LE | Leakage Emissions |
| LFG | Landfill gas |
| KP | Kyoto Protocol |
| LoA | Letter of Approval/Authorization |
| MP | Monitoring Plan |
| OM | Operating Margin |
| PA | Project Activity |
| PCP | Project Cycle Procedure |
| PDD | Project Design Document |
| PE | Project Emissions |
| PP | Project Participant |
| PS | Project Standard |
| tCO ₂ e | Tonnes of Carbon di oxide equivalent |
| UNFCCC | United Nations Framework Convention on Climate Change |
| VT | Verification Team |
| VVS | Validation and Verification Standard |
| VT | Verification Team |

Appendix 2. Competence of team members and technical reviewers

| Competence Statement | |
|----------------------|--------------------------------------|
| Name | Sergio Bonanno Cruz |
| Country | Brazil |
| Education | Post Graduate Diploma in Environment |

| | | | |
|---------------------------|---|-------------|------------|
| Experience | +25 Years | | |
| Field | Environmental Law, CDM, Energy, Climate Change | | |
| Approved Roles | | | |
| Team Leader | Yes | | |
| Validator | Yes | | |
| Verifier | Yes | | |
| Methodology Expert | Yes (ACM0001, ACM0002, AM0026, ACM0006, AMS ID) | | |
| Local expert | Brazil, Chile, Colombia | | |
| Financial Expert | Yes | | |
| Technical Reviewer | No | | |
| TA Expert | Yes (TA 1.2, 13.1) | | |
| | | | |
| Reviewed by | Shreya Garg | Date | 29/08/2019 |
| Approved by | Anshika Gupta | Date | 29/08/2019 |

| | | | |
|-----------------------------|--|-------------|------------|
| Competence Statement | | | |
| Name | Marcelo Sebben | | |
| Country | Brazil | | |
| Education | M.Sc. (Sustainable Energy System) B. Eng. (Chemical Engineering) | | |
| Experience | +12.5 Years | | |
| Field | Chemical process industry, CDM, Energy, Climate Change | | |
| Approved Roles | | | |
| Team Leader | Yes | | |
| Validator | Yes | | |
| Verifier | Yes | | |
| Methodology Expert | Yes (ACM0001, ACM0002, ACM0006, AM0065, AMS.I.D, AMS.I.C, AMS.I.E, AM0026, AMS.I.A, AMS.I.F, AMS. IIIE. AMS.IIIH, AMS.III.I, AMS.III.J.) | | |
| Local expert | Brazil, Chile, Honduras, Colombia | | |
| Financial Expert | Yes | | |
| Technical Reviewer | No | | |
| TA Expert | Yes (TA 1.1, 1.2, 5.1, 9.1,13.1) | | |
| | | | |
| Reviewed by | Shreya Garg | Date | 29/07/2020 |
| Approved by | Anshika Gupta | Date | 29/07/2020 |

| | | | |
|-----------------------------|--|--|--|
| Competence Statement | | | |
| Name | Ashok Gautam | | |
| Country | India | | |
| Education | M. Sc. (Environmental Sciences) M. Tech. (Energy & Environmental Management) | | |
| Experience | 16 Years + | | |
| Field | Energy, Climate Change & Environment | | |
| Approved Roles | | | |
| Team Leader | YES | | |
| Validator | YES | | |
| Verifier | YES | | |
| Methodology Expert | AMS-I.D., AMS-I.A., AMS-I.C., AMS-I.E, AMS-II.D., AMS-II.G., AMS-III.E., AMS-III.H., AMS-III.Q, AMS-III.Z., AMS-III.AV., AMS III.AR, AM0029, | | |

| | | | |
|---------------------------|--|-------------|------------|
| | AM0025, AM0056, ACM0001, ACM0002, ACM0004, ACM0012, ACM0006, AM0018, ACM0009, AM0034, AMS.I.B, ACM0003 | | |
| Local expert | YES (India) | | |
| Financial Expert | YES | | |
| Technical Reviewer | YES | | |
| TA Expert | YES (TA 1.1, TA 1.2, TA 3.1, TA 13.1) | | |
| | | | |
| Reviewed by | Shreya Garg | Date | 15/04/2021 |
| Approved by | Anshika Gupta | Date | 15/04/2021 |

Appendix 3. Documents reviewed or referenced

| No. | Author | Title | References to the document | Provider |
|-----|--------|--|---|----------|
| 1. | UNFCCC | Standard: CDM PS for project activities | version 03.0 | Others |
| 2. | UNFCCC | Standard: CDM PCP for project activities | version 03.0 | Others |
| 3. | UNFCCC | Standard: CDM VVS for project activities | version 03.0 | Others |
| 4. | UNFCCC | Form: CDM-MR-FORM | version 09.0 | Others |
| 5. | PP | Monitoring Report (draft) | version 1 – 05/05/2021 | PP |
| 6. | PP | Monitoring Report (revised) | version 2 – 11/06/2021 version 3 – 02/07/2021 | PP |
| 7. | PP | Monitoring Report (final) | version 4 – 21/11/2021 | PP |
| 8. | PP | ER Spreadsheet | version 1 | PP |
| 9. | PP | Registered PDD | version 8 – 05/03/2021 | Others |
| 10. | PP | Revised PDD (draft) | version 9 – 09/06/2021 version 10 – 02/07/2021 | PP |
| 11. | PP | Revised PDD (final) | version 11 – 11/11/2021 | PP |
| 12. | PP | 1. Revised ER estimates 2. Updated CERs ex ante Rev V5 | - version 1 - 11/11/2021 | PP |
| 13. | PP | Raw data Spreadsheets | March/2020 to December/2020 | PP |
| 14. | PP | Monthly hourly spreadsheets | March/2020 to December/2020 | PP |
| 15. | UNFCCC | <u>Methodology</u> - ACM0001 – Flaring or use of landfill gas | version 19.0 | Others |
| 16. | UNFCCC | <u>Methodological tools</u> - TOOL03 – Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion | version 03.0 | Others |
| | | - TOOL04 – Emissions from solid waste disposal sites | version 08.0 | |
| | | - TOOL05 – Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation | version 03.0 | |

| | | | | |
|-----|--|---|---|--------|
| | | <ul style="list-style-type: none"> - TOOL06 – Project emissions from flaring - TOOL07 – Tool to calculate the emission factor for an electricity system - TOOL08 – Tool to determine the mass flow of a greenhouse gas in a gaseous stream - TOOL09 – Determining the baseline efficiency of thermal or electric energy generation systems - TOOL12 – Project and leakage emissions from transportation of freight | version 03.0 version 07.0.0 version 03.0 version 02.0 version 01.1.0 | |
| 17. | EPE | Brazilian Energy Balance | https://www.epe.gov.br/sites-pt/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-601/topico-588/Relat%C3%B3rio%20S%C3%ADntese%20BEN%202021-ab%202020_v2.pdf | Others |
| 18. | INEA | <u>License</u> - Operation license # IN044886 – valid until 08/05/2023 | 08/05/2018 | PP |
| 19. | AB AB Jenbacher | <u>Commissioning and installation of Group Generators</u> - Operation tests – Commissioning report – Group Generators # 1 to # 6 - Operation tests – Commissioning report – Group Generators # 7 to # 12 - Installation report – Group Generators # 13 to # 16 | 19/12/2018 21/12/2018 from 08/06/2020 to 01/07/2020 | PP |
| 20. | John Zinc Schneider Biotechnogas Siemens ABB Status Instruments Contech Jenbacher | <u>Manuals</u> - Blowers - Energy meters - Flow meter - Gas analyser - LFG Pressure meter - LFG Temperature meter - Energy meter – FT-1 - Datasheet of Group Generator – 1562 kVA (1250 kW) – Group Generators # 13 to # 16 | - - - - - - - 05/02/2019 | PP |
| 21. | Orizon | <u>Electricity consumption – Haztec</u> - Records (monitoring of electricity meter Schneider PM1200) | Mar to Dec/2020 | PP |
| 22. | Niegar CCEE | <u>Electricity generation and consumption – Niegar</u> - Records (monitoring of electricity meter Schneider ION8650) - CCEE reports | Mar to Dec/2020 Mar to Dec/2020 | PP |
| 23. | Aggreko | <u>Electricity generation and consumption – Aggreko</u> | Nov and Dec/2020 | PP |

| | | | | |
|-----|---|---|---|-------|
| | | - Records (monitoring of electricity meter ELO2173) | | |
| | Light (company responsible for electricity distribution in the State of Rio de Janeiro) | - Invoices of Light | Nov and Dec/2020 | |
| 24. | Fundação COPPETEC | <u>Waste Composition</u> Third party's study of the gravimetry of waste composition | January/2020 | PP |
| 25. | Biotechogas | <u>LFG Collection Efficiency</u> Letter stating the collection efficiency in 88.4%, based on historical data | 04/06/2020 | PP |
| 26. | PP | <u>Temporary Deviation</u> - Deviation spreadsheet | version 2 | PP |
| | PP | - Cross check spreadsheet | - | |
| | Jenbacher | - Datasheet of Group Generator – 1562 kVA (1250 kW) – Group Generators # 13 to # 16 | 05/02/2019 | |
| 27. | - | DNA of Brazil – Emission factor | https://antigo.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/texto_geral/emissao_despacho.html | Other |
| 28. | - | CCEE | https://www.ccee.org.br | Other |
| 29. | - | IPCC publications | www.ipcc-nggip.iges.or.jp | Other |
| 30. | - | UNFCCC | http://cdm.unfccc.int | Other |
| 31. | Biotechogas | LFG collection efficiency Technical specifications of the biogas collection network – CTR Nova Iguaçu | rev.00 – Sep/2021 | PP |
| 32. | PP | <u>Revised Cash flow</u> Updated NovaGerar Cash Flow 2004 v2 2019 11 26 FES Rev V3 | Rev V3 | PP |

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. Remaining FAR from validation and/or previous verifications

Not applicable

Table 2. CL from this verification

| CL ID | 01 | Section no. | E.1 | Date: 03/06/2021 |
|---|----|-------------|-----|------------------|
| Description of CL | | | | |
| <i>In accordance with the instructions for filling out the MR, in Sections B.2.2 and B.2.5 it is missing the reference number and approval date of PRCs approved previously to the present monitoring period.</i> | | | | |
| Project participant response | | | | Date: 08/06/2021 |
| The requested information was included in the revised version of the Monitoring Report. | | | | |
| Documentation provided by project participant | | | | |
| Monitoring Report version 02 | | | | |
| DOE assessment | | | | Date: 15/06/2021 |
| Sections B.2.2 and B.2.5 are complete with all PRCs already presented and approved by the EB. | | | | |
| CL is closed | | | | |

| | | | | |
|---|----|--------------------|-----|-------------------------|
| CL ID | 02 | Section no. | E.3 | Date: 03/06/2021 |
| Description of CL | | | | |
| <i>In Section B.1, the description of the project activity is not in accordance with actual scenario, as only the collection and flaring systems are described.</i> | | | | |
| Project participant response | | | | Date: 08/06/2021 |
| The description of the electricity component was included in Section B.1. of the revised version of the Monitoring Report. | | | | |
| Documentation provided by project participant | | | | |
| Monitoring Report version 02 | | | | |
| DOE assessment | | | | Date: 15/06/2021 |
| Section B.1 of the MR was revised and the system for the electricity generations is fully described. CL is closed | | | | |

| | | | | |
|--|----|--------------------|-------|-------------------------|
| CL ID | 03 | Section no. | E.6.2 | Date: 03/06/2021 |
| Description of CL | | | | |
| <i>In Section D.2 – parameter $NCV_{fuel,y}$: it is not clear the use of the IPCC value in disagreement with registered PDD, which states that the value shall be from “Regional or national default values”.</i> | | | | |
| Project participant response | | | | Date: 08/06/2021 |
| The source of data used for the mentioned parameter was revised accordingly considering the information provided in the registered PDD. | | | | |
| Documentation provided by project participant | | | | |
| Monitoring Report version 02 | | | | |
| DOE assessment | | | | Date: 15/06/2021 |
| It was clarified that the value used is the Brazilian default value and it is in within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines, in accordance with PDD. CL is closed | | | | |

| | | | | |
|--|----|--------------------|-------|-------------------------|
| CL ID | 04 | Section no. | E.6.2 | Date: 03/06/2021 |
| Description of CL | | | | |
| <i>In Section D.2 – parameter $O_{pj,h}$: it is not clear if the parameter has also monitored the electricity group generators, as only the flare operation is described.</i> | | | | |
| Project participant response | | | | Date: 08/06/2021 |
| The mentioned parameter was monitored for the electricity component as per item c) Products generated, i.e. electricity generation. | | | | |
| Documentation provided by project participant | | | | |
| Monitoring Report version 02 | | | | |
| DOE assessment | | | | Date: 15/06/2021 |
| Section D.2 was revised and it is clear that parameter $O_{pj,h}$ is also used to monitor the electricity group generators. CL is closed | | | | |

Table 3. CAR from this verification

| | | | | |
|---|----|--------------------|-------|-------------------------|
| CAR ID | 01 | Section no. | E.6.1 | Date: 03/06/2021 |
| Description of CAR | | | | |
| <i>It was verified that the value of fixed parameter MM_k is not correct as per TOOL06 – version 03.0.</i> | | | | |
| Project participant response | | | | Date: 08/06/2021 |
| The value is correct as per the source indicated (i.e., TOOL08 – version 03.0). | | | | |
| Documentation provided by project participant | | | | |
| -- | | | | |
| DOE assessment | | | | Date: 15/06/2021 |
| No change is necessary as the source of the value is TOOL08 – version 03.0, in which the molecular mass of nitrogen is 28.01 kg/mol. CAR is closed | | | | |

| | | | | |
|--|----|--------------------|---------------------|-------------------------|
| CAR ID | 02 | Section no. | E.6.2; E.8.2; E.8.4 | Date: 03/06/2021 |
| Description of CAR | | | | |
| <i>The value of parameter TDL for the year 2020 is not correct as it is not the most recent one of the Brazilian Energy Balance.</i> | | | | |
| Project participant response | | | | Date: 08/06/2021 |

| | |
|---|-------------------------|
| The value of TDL was updated, from 26.3% to 27.6% based on most recent data available of Brazilian Energy Balance 2021, base year 2020. | |
| Documentation provided by project participant | |
| Brazilian energy Balance available at https://www.epe.gov.br/sites-pt/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-601/topico-588/Relat%C3%B3rio%20S%C3%ADntese%20BEN%202021-ab%202020_v2.pdf | |
| Monitoring Report, version 02 | |
| Monthly CERs calculations Spreadsheet | |
| DOE assessment | Date: 15/06/2021 |
| The value of parameter <i>TDL</i> for the year 2020 was updated with the most recent one of the Brazilian Energy Balance 2021 (year base 2020). | |
| CAR is closed | |

| | | | | |
|---|----|--------------------|---------------------|-------------------------|
| CAR ID | 03 | Section no. | E.6.2; E.8.2; E.8.4 | Date: 03/06/2021 |
| Description of CAR | | | | |
| <i>The value of parameter $FC_{i,j,y}$ for the month of October is not in accordance with evidences presented to the verification team.</i> | | | | |
| Project participant response | | | | Date: 08/06/2021 |
| Values for $FC_{i,j,y}$ October 2020 have been modified in version 02 of the Monitoring Report, in Sections E.1 and E.2, as well as in the CER spreadsheet. | | | | |
| Documentation provided by project participant | | | | |
| Monitoring Report, version 02 | | | | |
| Monthly CERs calculations Spreadsheet | | | | |
| DOE assessment | | | | Date: 15/06/2021 |
| The value of parameter $FC_{i,j,y}$ for the month of October was correctly revised and it is in accordance with evidences presented to the verification team. The PE calculations were also correctly revised with the correct value. | | | | |
| CAR is closed | | | | |

| | | | | |
|--|----|--------------------|-------|---------------------------------------|
| CAR ID | 04 | Section no. | E.6.2 | Date: 03/06/2021 |
| Description of CAR | | | | |
| <i>In Section E.1, the options of TOOL08 given for the flow measurement are not the one proposed on the requested PRC, as the one used for this measurement in the present monitoring period.</i> | | | | |
| Project participant response | | | | Date: 08/06/2021 |
| The Section E.1 of Monitoring Report was revised and the option C of TOOL08 was included. Also, Section D.1 has been revised to include parameters P_n and T_n , used in Option C equations. | | | | |
| Documentation provided by project participant | | | | |
| Monitoring Report, version 02 | | | | |
| DOE assessment | | | | Date: 15/06/2021 02/07/2021 |
| Option C of TOOL08 was included in Section E.1, as it was used for the flow measurement, in accordance with proposed PRC. In addition, the parameters necessary for this measurement were included in Section D.1. | | | | |
| Refer to the Validation report for post-registration changes submitted along with this Verification Report for the details of the requested PRC. | | | | |
| Nevertheless, it is not clear which option (A, B or C) was used for determining $F_{CH_4,PJ}$. | | | | |
| CAR remains open | | | | |
| Project participant response #2 | | | | Date: 02/07/2021 |
| Included that Option C of TOOL08 was used. | | | | |
| Documentation provided by project participant | | | | |
| Monitoring Report, version 03 | | | | |
| DOE assessment #2 | | | | Date: 03/07/2021 |
| It is now clear in Section E.1 that Option C was used for determining $F_{CH_4,PJ}$ in the current monitoring period. | | | | |
| CAR is closed | | | | |

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|---|----|--------------------|-------|-------------------------|
| CAR ID | 05 | Section no. | E.8.6 | Date: 03/06/2021 |
| Description of CAR | | | | |
| <i>In Section E.6, the calculated increase in achieved emission reductions is not correct.</i> | | | | |
| <i>In addition, it is not clear by the justifications given in the section, the reason for the increase of the actual values of the monitoring period with the estimates in the registered PDD.</i> | | | | |
| Project participant response | | | | Date: 08/06/2021 |

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|---|-------------------------|
| The section E.6 was revised on Monitoring Report version 02, based also on revised PDD, version 09. The CERs calculated are 6% bellow of revised CERs estimation on PDD. | |
| Documentation provided by project participant | |
| Monitoring Report version 02 PDD version 9 | |
| DOE assessment | Date: 15/06/2021 |
| Section E.6 was totally revised since with the requested PRCs (Correction of the Waste composition and Correction of Collection efficiency), the actual ERs are 65 below the estimated for the monitoring period. Refer to the Validation report for post-registration changes submitted along with this Verification Report for the details of the requested PRC. CAR is closed | |

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|--|----|--|-------|--|---|---|--|---|--|---|---|
| CAR ID | 06 | Section no. | E.6.1 | Date: 08/09/2021 | | | | | | | |
| Description of CAR | | | | | | | | | | | |
| <p><i>Regarding the change in the LFG collection efficiency:</i></p> <ol style="list-style-type: none"> <i>in Section B.2.2, the change of the LFG collection efficiency was classified as Correction. Nevertheless, as it was verified that there are some design changes, the classification is not correct;</i> <i>there is no assessment of the impact of the LFG collection efficiency in the electricity generation estimated ex-ante;</i> <i>the proposed change is not in accordance with applied methodology, as it requires a project to apply either default 50% value or an efficiency based on the "technical specifications of the LFG capture system to be installed", whereas the revised value proposed by the PP is based on the historical/actual data provided by the LFG implementer.</i> | | | | | | | | | | | |
| Project participant response | | | | Date: 21/11/2021 | | | | | | | |
| <ol style="list-style-type: none"> In the PDD version 10, the change of collection efficiency was considered as a correction because this data was not updated when the previous PRC was done. Based on incompleteness request received, PP decided to categorize the change of the LFG collection efficiency as a Change to Project Design (PRC) in face of the nature of the change. PRC PDD as well as the Monitoring Report have been amended accordingly. The proposed change in the LFG collection efficiency has no impact on the electricity generation that was estimated prior to the PRC and consequently the project financial additionality. LFG collection efficiency change did not impact forecast installed capacity and electricity generated by the project activity. LFG collection efficiency has changed from 50% (according to Data / Parameter table 6 from ACM0001 version 19.0, default value) to 95%. This change does not adversely impact the electricity generation that was estimated prior to the PRC and therefore the additionality by the fact that electricity generation was estimated in the previously approved additionality financial analysis, under tab "Schedule Engines", cells I19 to I25, according to the calculation rational below: <table border="1"> <tr> <td>Ex-ante yearly electricity generation (MWh)</td> <td>=</td> <td>Sum of the installed capacity of electricity generation plant (MW)</td> <td>x</td> <td>number of hours in the year (h/year)</td> <td>x</td> <td>Plant Load Factor (%)²</td> </tr> </table> <p>Thus, it is demonstrated that collection efficiency does not impact electricity generation that was estimated prior to the PRC and therefore the additionality. These revisions neither influences the applicability of the methodology nor the additionality and scale of the project, as determined in the provisions of the applicable paragraph of the Project Standard. Furthermore, revised versions of the Emission Reductions spreadsheets are included in the current post registration changes PDD with a collection efficiency of 95%, as well as a revised Financial Spreadsheet where an additional tab is added to demonstrate that the increased amount of LFG due to the increase of the LFG collection efficiency has no effect on the amount of electricity generated. This is due to the fact that the electricity generation plant is already operating at its maximum capacity. Thus, to generate additional revenues additional gensets would have to be installed.</p> | | | | | Ex-ante yearly electricity generation (MWh) | = | Sum of the installed capacity of electricity generation plant (MW) | x | number of hours in the year (h/year) | x | Plant Load Factor (%) ² |
| Ex-ante yearly electricity generation (MWh) | = | Sum of the installed capacity of electricity generation plant (MW) | x | number of hours in the year (h/year) | x | Plant Load Factor (%) ² | | | | | |

² Maximum possible value to demonstrate conservativeness on the additionality analysis (100%) where:
Load Factor (%) = Electricity generated in the plant (MWh) / Installed capacity (MW) / 8760 (h/year)

| | |
|--|-------------------------|
| <p>As per the above mentioned non increase on electricity generation it is deemed justified that there is no impact in additionality.</p> <p>In addition, to demonstrate that there is no impact in additionality even in the hypothetical case that a Plant Load Factor of 100% is obtained in the most conservative scenario of the Electricity Generation Plant being operational 100% of the time, additional scenarios were included in the financial analysis as well as sensitivity analysis for the Plant Load Factor of 100%. In all cases the project activity is additional.</p> <p>c. In line with ACM0001 version 19 (table 6, page 27) and with the objective to present a technical specification of the LFG capture system to be installed, instead of historical/actual data, a new Technical Specification Report carried out by Biotecnogas, company currently responsible for project LFG collection system continuous management has been presented to the DOE.</p> | |
| Documentation provided by project participant | |
| <p>Monitoring Report version 4</p> <p>PDD version 10</p> <p>Technical specifications of the biogas collection network – CTR Nova Iguaçu^{/31/}</p> <p>Cash flow revised assessment^{/32/}</p> | |
| DOE assessment | Date: 25/11/2021 |
| <p>a. as design changes were evidenced, the PRC was reclassified to Change to the project design;</p> <p>b. it was evidenced by the equation of calculation of estimated electricity generation that it was calculated considering the total installed capacity of the engines used to generate electricity and a PLF (considering maintenance activities). Therefore, the increase in the LFG collection efficiency has absolutely no impact in the estimated electricity generation.</p> <p>In addition, to ensure that no adverse impact is observed for the additionality assessment, it was performed a new assessment^{/32/}, where it was included the evaluation of the increase in the amount of LFG. Even to be more conservative, it was considered the hypothetical scenario of 100% of PLF, in other words, that no maintenance at all would be necessary for the engines, which obviously is not feasible. Even though, the project continues additional.</p> <p>For CERs estimates ex-ante, there is also no impact regarding the change in the LFG collection efficiency, which is evidenced by the revised CERs calculations ex-ante^{/12-2/}, where the plant load factor used is 100% and no variation in the amount of CERs is verified for the generated electricity;</p> <p>c. to support the request for PRC Change to the project design, in accordance with ACM0001, a report with the technical specifications of the LFG capture system from LFG implementer – Technical specifications of the biogas collection network – CTR Nova Iguaçu^{/31/} – is being presented with the evaluation that the LFG collection efficiency of the PA is 95%. Therefore, this value of 95% should be used instead of the default 50% value.</p> <p>Refer to the Validation report for post-registration changes that is being presented along with this Verification Report for full assessment.</p> <p>CAR is closed</p> | |

Table 4. FAR from this verification

Not applicable

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Document information

| <i>Version</i> | <i>Date</i> | <i>Description</i> |
|--|-----------------|---|
| 04.0 | 6 April 2021 | Revision to: <ul style="list-style-type: none">• Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR). |
| 03.0 | 31 May 2019 | Revision to: <ul style="list-style-type: none">• Ensure consistency with version 02.0 of the “CDM validation and verification standard for project activities” (CDM-EB93-A05-STAN);• Make structural and editorial improvements. |
| 02.1 | 11 January 2018 | Editorial revision to correct the numbering of appendices in the instructions. |
| 02.0 | 31 October 2017 | Revision to align with the requirements of the “CDM validation and verification standard for project activities” (version 01.0). |
| 01.0 | 23 March 2015 | Initial publication. |
| Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: project activities, verifying and certifying | | |