



**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 | CTR Candeias Landfill Gas Project UNFCCC Ref. Number: 3958 | | |
| Scale of the project activity | <input checked="" type="checkbox"/> Large-scale <input type="checkbox"/> Small-scale | | |
| Version number of the verification and certification report | 1 | | |
| Completion date of the verification and certification report | 10/05/2021 | | |
| Monitoring period number and duration of this monitoring period | 6 th Monitoring Period (1 st MP of 2 nd CP) 29/09/2018 to 02/03/2020 (including both days) | | |
| Version number of the monitoring report to which this report applies | 04 | | |
| Crediting period of the project activity corresponding to this monitoring period | Renewable – 7 years From 29/09/2018 to 28/09/2025 | | |
| Project participants | <u>Brazil:</u> - Haztec Tecnologia e Planejamento Ambiental SA <u>Switzerland:</u> - ALLCOT AG | | |
| Host Party | Brazil | | |
| Applied methodologies and standardized baselines | ACM0001 – version 19 – Flaring or use of landfill gas | | |
| Mandatory sectoral scopes | 1 and 13 | | |
| Conditional sectoral scopes, if applicable | - | | |
| Estimated amount of GHG emission reductions or GHG removals for this monitoring duration in the registered PDD | 268,172 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 |
| | 0 | 170,950 tCO ₂ e | 0 |
| 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 consists in capturing landfill gas (LFG) resulted from the decomposition of organic waste in CTR Candeias Sanitary landfill and use it for electricity generation or burning it in flares. It uses a collecting system composed by horizontal and vertical wells to direct the gas into electricity group generators, or in case they are not operative, to a high efficiency enclosed flare system to burn the LFG, so reducing the greenhouse gas emissions previously emitted into the atmosphere.

During the current monitoring period, the energy generation plant comprehended 10 engines with 1,426 kW each totalizing 14,260 kW of installed capacity¹.

The LFG collection, electricity generation and flaring system installed at CTR Candeias landfill is located at the city of Jaboatão dos Guararapes (metropolitan area of Recife), State of Pernambuco, Brazil – Latitude: -8.164258; Longitude: -34.985286^{13/}.

During this monitoring period, due to the implementation of the engines, the LFG plant was not operative from 29/09/2018 until 26/07/2019. Therefore, ER from flaring CH₄ were only accounted from this date on².

In addition, for baseline emissions from electricity generation, the start date is from 30/07/2019, which is the date which the 1st engine had its commissioning approved^{16-1/}.

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 “CTR Candeias Landfill Gas Project” for the period from 29/09/2018 to 02/03/2020 (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^{11/}, including applicable tool(s) and, where applicable, the standardized baseline.

Verification process

The verification process involved following:

- contract with Haztec Tecnologia e Planejamento Ambiental S.A. for the scope of verification;
- publication of monitoring report;
- desk review;
- physical on-site inspection;
- issuance of verification findings;
- reporting, calculation checks, QA/QC and resolution of findings;
- issuance of draft verification report;

¹ It is important to clarify that although only 10 engines were installed during the monitoring period belonging to this verification process, during the on-site inspection, 12 engines were already installed. The PDD estimates 20 engines in total with equal individual capacity each.

² Date which information was duly available in the LFG system^{14-1/}

- 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 “CTR Candeias Landfill Gas Project”, with UNFCCC Ref. Number 3958, for the monitoring period from 29/09/2018 to 02/03/2020. 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). 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 170,950 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 | Sebben | Marcelo | Verifit | Y | Y | Y | Y |
| 2. | Local Expert | OR | Sebben | Marcelo | Verifit | Y | Y | Y | Y |
| 3. | Methodological Expert | OR | Sebben | Marcelo | Verifit | Y | Y | Y | Y |
| 4. | Technical Expert | OR | Sebben | Marcelo | Verifit | Y | Y | 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 | Garg | Shreya | 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, | Electronic records used for ER calculation to be checked with the source data available as plant records. |

| | | | | |
|----|---|---------------|---|---|
| | | | <i>chances of possible human errors, in recording and archiving, are minimised.</i> | |
| 2. | <i>Error in transferring the data to ER sheet</i> | <i>Medium</i> | <i>Transfer of data from source to ER calculation involve human intervention and might lead to inconsistencies.</i> | <i>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 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^{3/} for project activities – version 02.0 – para. 326, the prescribed threshold for materiality for the project activity is 2.0% as its emissions reductions is less than 300,000 tCO₂/year.

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: 03/03/2021 | | | | |
|--|---|---|------------|----------------|
| No. | Activity performed on-site | Site location | Date | Team member |
| 1. | Opening Meeting | Candeias landfill (Jaboatão dos Guararapes) | 03/03/2021 | Marcelo Sebben |
| 2. | Physical inspection of the project activity: site visit and interview of monitoring personnel | Candeias landfill (Jaboatão dos Guararapes) | 03/03/2021 | Marcelo Sebben |
| 3. | Checking of management and operational system | Candeias landfill (Jaboatão dos Guararapes) | 03/03/2021 | Marcelo Sebben |
| 4. | Verification checklist: compliance of monitoring procedures followed at project site with registered PDD and monitoring methodology. Management and monitoring procedures followed at project site. | Candeias landfill (Jaboatão dos Guararapes) | 03/03/2021 | Marcelo Sebben |
| 5. | Review of monitored data and relevant documents in accordance with registered monitoring plan and applied monitoring methodology | Candeias landfill (Jaboatão dos Guararapes) | 03/03/2021 | Marcelo Sebben |

| | | | | |
|----|---|---|------------|----------------|
| 6. | Review of ER calculations in accordance with applied methodology and relevant tools | Candeias landfill (Jaboatão dos Guararapes) | 03/03/2021 | Marcelo Sebben |
| 7. | Presentation of preliminary findings | Candeias landfill (Jaboatão dos Guararapes) | 03/03/2021 | Marcelo Sebben |
| 8. | Closing meeting | Candeias landfill (Jaboatão dos Guararapes) | 03/03/2021 | Marcelo Sebben |
| 9. | Presentation of final findings after all raw data analysis | Virtual | 09/03/2021 | Marcelo Sebben |

D.3. Interviews

| No. | Interviewee | | | Date | Subject | Team member |
|-----|-------------|------------|-------------|------------|--|----------------|
| | Last name | First name | Affiliation | | | |
| 1. | Mondini | Jonney | Haztec | 03/03/2021 | Project activity operation | Marcelo Sebben |
| 2. | Ficher | Henrique | Asja | 03/03/2021 | Project management Electricity generation | Marcelo Sebben |
| 3. | Santos | Camilla | Ecopesa | 03/03/2021 | Environmental and Social activities | Marcelo Sebben |
| 4. | Hayashibara | Arnaldo | Asja | 03/03/2021 | Project activity operation and monitoring of parameters | Marcelo Sebben |
| 5. | Sprovieri | João | BENG | 03/03/2021 | MR ER calculations Project activity operation and monitoring of parameters | Marcelo Sebben |

D.4. Sampling approach

No sampling have been applied. All data were duly checked through extensive comparison between calculation spreadsheet and raw data downloaded directly from company's system or electricity meter. Due to the huge amount of data (raw data from landfill gas has been generated every minute), in order to check 100% of data, the following procedure has been carried out:

- Raw data has been provided in daily spreadsheets. These daily spreadsheet were aggregated monthly through a Macro (excel tool)^{/14-2/} in one single file.
- This file presented all data provided from landfill gas on a minute basis each month. In order to compare with monthly ER calculation spreadsheet, a sum comparison has been carried out for all parameters aggregated. In case any discrepancy is found, the correction was requested.
- By applying this procedures, it could be possible to check 100% of data aggregate. After findings resolution, no discrepancy remained.
- The data related to electricity generation and consumption was directly downloaded from system hourly and therefore 100% of data has been checked
- Data used for calculating grid emission factor calculation was directly downloaded from DNA's website^{/17/} and therefore, 100% of data could be directly 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 | - | - | - |
| Compliance of the project implementation and operation with the registered PDD | CL 01 | - | - |
| Post-registration changes | CL 02 | - | - |
| Compliance of the registered monitoring plan with the methodologies including applicable tools and standardized baselines | CL 03 | - | - |
| Compliance of monitoring activities with the registered monitoring plan | CL 04 | - | - |
| Compliance with the calibration frequency requirements for measuring instruments | - | CAR 01 | - |
| Assessment of data and calculation of emission reductions or net removals | CL 05 | CAR 02 CAR 03 | - |
| Assessment of reported sustainable development co-benefits | - | - | - |
| Global stakeholder consultation | - | - | - |
| Others (please specify) | - | - | - |
| Total | 5 | 3 | 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 | - |
| Conclusion | The latest version of the verification template (CDM-MR-FORM – version 08.0 ^{04/}) 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 FARs 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>The project activity consists in capturing landfill gas (LFG) resulted from the decomposition of organic waste in CTR Candeias Sanitary landfill and use it for electricity generation or burning it in flares. It uses a collecting system composed by horizontal and vertical wells to direct the gas into electricity group generators, or in case they are not operative or in case there is excess gas, to a high efficiency enclosed flare system to burn the LFG, so reducing the greenhouse gas emissions previously emitted into the atmosphere.</p> <p>The main equipment used at the project activity is given below:</p> <ul style="list-style-type: none"> - Landfill gas collection system which comprehends horizontal and vertical wells used to collect the landfill gas - Landfill gas pre-treatment system used to filter and to demister the LFG - 01 enclosed flare – Biotecnogas – Model BTG 2500HT, S/N 163/13; - 02 blowers – Continental Industrie – Model 400A.04 and 251A.05 – Serial #s 09400001 and 192510003 respectively; |
|------------------------------|--|

| | |
|-------------------|--|
| | <ul style="list-style-type: none"> - 10 electricity generation sets (genset)³ with installed capacity equal to 1,426 kW. Serial numbers as follows: <ul style="list-style-type: none"> o GenSet 1: Design S/N: 1358705 o GenSet 2: Design S/N: 1358518 o GenSet 3: Design S/N: 1358580 o GenSet 4: Design S/N: 1358607 o GenSet 5: Design S/N: 1358636 o GenSet 6: Design S/N: 1358615 o GenSet 7: Design S/N: 1358488 o GenSet 8: Design S/N: 1358667 o GenSet 9: Design S/N: 1358556 o GenSet 10: Design S/N: 1422633 o GenSet 11: Design S/N: 1462633 (not operating during current MP) o GenSet 12: Design S/N: 1462623 (not operating during current MP) - Instruments used to measure the monitoring parameters (detailed parameter wise in section E.6.2) <p>However it is not clearly described in the MR why there is no data monitored from 29/09/2018 until 26/07/2019 nor which were the exact start date of operation of both flare and engines for this 2nd crediting period.</p> |
| Findings | <p>CL 01</p> <p><i>MR section A.1. It is not duly clarified in the MR why there is no measurement from 29/09/2018 until 26/07/2019. Moreover, it is not clear why the electricity generation has been accounted from 26/07/2019 if its commissioning approval was only on 30/07/2019.</i></p> |
| 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 approved PDD during the present monitoring period.</p> <p>There are no actual or proposed deviations or changes in the implementation of the registered project activity.</p> <p>The project activity has been divided in two implementation phases at the PDD:</p> <ol style="list-style-type: none"> a. the landfill gas collection and enclosed flare system. This phase has been implemented and it was operational during the present monitoring period; b. the electricity generation phase which is partially implemented during this monitoring period (10 generation sets were installed during the current monitoring period out of 20 that are estimated in the currently PDD). <p>The exact reinstallation date of the flare is 26/07/2019^{15/},^{24/} and of the 1st engine is 30/07/2019^{16/}.</p> <p>The implementation of the project activity is in accordance with current valid PDD.</p> |

E.4. Post-registration changes

E.4.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents⁴

| | |
|------------------------------|---|
| Means of verification | It has been observed that there is no temporary deviations approved that impact this MP or that are being submitted with this issuance request. |
| Findings | N/A |
| Conclusion | Not applicable as no temporary deviations from the registered monitoring plan or from monitoring methodology have been submitted to the UNFCCC prior and/or during the current monitoring period. |

³ Only 10 gensets were operative during the monitoring period but during the on-site inspection, there were 12 Gensets installed.

⁴ 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.4.2. Corrections

| | |
|------------------------------|---|
| Means of verification | <p>It has been observed that no corrections have been identified for the present monitoring period.</p> <p>Nevertheless, three corrections have been requested and approved before the present monitoring period since the registration of the PA:</p> <ul style="list-style-type: none"> a. PRC-3958-001 – approved on 07/02/2014; b. PRC-3958-002 – approved on 18/04/2017. c. PRC-3958-003 – approved on 20/01/2021 <p>As not all Corrections approved prior to the present monitoring period have been listed, a CL has been raised.</p> |
| Findings | <p>CL 02</p> <p><i>MR, section B.2.2: corrections ref #s PRC-3958-001, PRC-3958-002 and PRC-3958-003 have not being mentioned in the MR unlike required by instructions for completing the MR.</i></p> |
| Conclusion | No corrections were needed during this MP and after findings resolution all corrections prior approved since the registration of this PA have been duly mentioned. |

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

| | |
|------------------------------|--|
| Means of verification | Not applicable as there was no change in the start date of the crediting period. |
| Findings | N/A |
| Conclusion | Not applicable |

E.4.4. Inclusion of a monitoring plan

| | |
|------------------------------|--|
| Means of verification | Not applicable as monitoring plan is part of the registered PDD. |
| Findings | N/A |
| Conclusion | Not applicable |

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

| | |
|------------------------------|---|
| Means of verification | <p>It has been observed during this MP that there is no permanent change to be applied. Nevertheless, one permanent change deviation from the registered monitoring plan has been requested and approved before the present monitoring period: PRC-3958-001 – approved on 07/02/2014.</p> |
| Findings | N/A |
| Conclusion | No permanent changes deviations from the registered monitoring plan or from monitoring methodology have been submitted to the UNFCCC during the current monitoring period. Moreover, all permanent deviations approved prior to this monitoring period were duly mentioned in the MR. |

E.4.6. Changes to the project design

| | |
|------------------------------|--|
| Means of verification | <p>It has been observed during this MP that there is no changes to the project design that are being requested during the current monitoring period. Nevertheless, one change design from the registered PDD has been requested and approved before the present monitoring period: PRC-3958-003 – approved on 20/01/2021</p> |
| Findings | N/A |
| Conclusion | No permanent design changes have been submitted to the UNFCCC during the current monitoring period. Moreover, all design changes approved prior to this monitoring period were duly mentioned in the MR. |

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

Not applicable as it is not an afforestation and reforestation PA.

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 – version 19.0 – “Flaring or use of landfill gas” ^{11/} , 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 in order 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 registered PDD):</p> <ul style="list-style-type: none"> - EF_{grid,BM,2017} (<i>Build margin emission factor for the grid in year y</i>): 0.0028 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 CH₄</i>): 25 tCO₂e/tCH₄; - R_u (<i>Universal ideal gas constant</i>): 8,314.472 Pa.m³/kmol.K⁵. - SPEC_{flare} (<i>Manufacturer's flare specifications for temperature, flow rate and maintenance schedule</i>): <ul style="list-style-type: none"> o Minimum flare temperature: 850°C o Maximum flare temperature: 1200°C o Minimum and maximum inlet flow rate: 500 to 2,500 Nm³/h o Maximum duration between maintenance events: 7 days - 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 greenhouse gas i – CH₄</i>): 16.04 kg/kmol; - MM_k (<i>Molecular mass of greenhouse gas k – N₂</i>): 28.01 kg/kmol; - MM_{H2O} (<i>Molecular mass of water</i>): 18.0152 kg/kmol; <p>The following parameters were used during validation phase, are listed in the PDD but were not applied during this monitoring period.</p> <ul style="list-style-type: none"> - Waste composition - η_{PJ} (<i>Efficiency of the LFG capture system that is be installed in the project activity</i>): - Φ_{default} (<i>Default value for the model correction factor to account for model uncertainties</i>): - OX (<i>Oxidation factor</i>): - F (<i>Fraction of methane in the SWDS gas</i>): - DOC_{f,default} (<i>Default value for the fraction of degradable organic carbon in MSW that decomposes in the SWDS</i>): - MCF_{default} (<i>Methane correction factor</i>): - DOC_j (<i>Fraction of degradable organic carbon in the waste type j</i>); - k_j (<i>Decay rate for waste type j</i>) |
|------------------------------|--|

⁵ This value refers to Ideal Gas Constant as per TOOL08^{12-7/}. It is important to point out that the value is correctly applied in the calculations, despite the value for this constant in TOOL06 para 39 be incorrect (i.e. 0.008314472 Pa.m³/kmol.K)

| | |
|-------------------|---|
| | However, not all applicable fixed parameter were mentioned in the MR, and therefore a CL has been raised. |
| Findings | CL 03 <i>MR, section D.1 not all applicable fixed parameters were included in the Section D.1 of the MR unlike required by instructions for completing the MR.</i> |
| Conclusion | The parameters mentioned in the MR and corresponding emission reduction calculations spreadsheet are consistent with the approved PDD. The applied values are correct. |

E.6.2. Data and parameters monitored

| Means of verification | <p>All monitored parameters listed in MR used to calculate baseline, project, and leakage GHG emissions of the PA were checked against the registered PDD. The parameters of the registered PDD were verified in order to check its consistency with CDM tools and guidance to ER calculations.</p> <p>The monitored parameters are the following:</p> <table border="1"> <tr> <th colspan="2">1. $EF_{grid,CM}$: CO₂ emission factor of the Brazilian grid electricity during year y</th></tr> <tr> <th>Criteria/Requirements</th><th>Assessment/Observation</th></tr> <tr> <td>Measuring / Reading / Recording frequency</td><td>Parameter corresponds to the combined margin grid emission factor and was calculated yearly using the "Tool to calculate the emission factor for an electricity system". This parameter takes into account the values of the parameter $EF_{OM-DD,y}^{9-2/}$ calculated based on the available data published by Brazilian DNA^{17/} ex-post and the parameter EF_{BM} which is fixed ex-ante.</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>N/A</td></tr> <tr> <td>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?</td><td>N/A</td></tr> <tr> <td>Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?</td><td>N/A</td></tr> <tr> <td>Calibration frequency / interval</td><td>N/A</td></tr> <tr> <td>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?</td><td>N/A</td></tr> </table> | 1. $EF_{grid,CM}$: CO ₂ emission factor of the Brazilian grid electricity during year y | | Criteria/Requirements | Assessment/Observation | Measuring / Reading / Recording frequency | Parameter corresponds to the combined margin grid emission factor and was calculated yearly using the "Tool to calculate the emission factor for an electricity system". This parameter takes into account the values of the parameter $EF_{OM-DD,y}^{9-2/}$ calculated based on the available data published by Brazilian DNA ^{17/} ex-post and the parameter EF_{BM} which is fixed ex-ante. | 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 |
|---|---|---|--|-----------------------|------------------------|---|---|---|-----|----------------------|-----|---|-----|---|-----|----------------------------------|-----|--|-----|
| 1. $EF_{grid,CM}$: CO ₂ emission factor of the Brazilian grid electricity during year y | | | | | | | | | | | | | | | | | | | |
| Criteria/Requirements | Assessment/Observation | | | | | | | | | | | | | | | | | | |
| Measuring / Reading / Recording frequency | Parameter corresponds to the combined margin grid emission factor and was calculated yearly using the "Tool to calculate the emission factor for an electricity system". This parameter takes into account the values of the parameter $EF_{OM-DD,y}^{9-2/}$ calculated based on the available data published by Brazilian DNA ^{17/} ex-post and the parameter EF_{BM} which is fixed ex-ante. | | | | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | | | | |

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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? | <p>The values of the MR were verified their consistency with aggregated values of the Excel spreadsheets^{/9-2/} and with the evidences provided for its calculation ^{/17/}. As the calculation provided was not correct a CAR has been raised. Refer to CAR 02.</p> <p>After findings conclusion it has been observed that the values applied in the ER calculations are determined in accordance with current PDD and applied TOOL07</p> |
| | If applicable, has the reported data been crosschecked with other available data? | Values used in the calculation were checked against evidences provided. ^{/17/} |
| | 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 02.0? | N/A |
| 2. $EF_{grid,OM}$: Operating margin emission factor of the Brazilian grid | | |
| Criteria/Requirements | | Assessment/Observation |
| Measuring / Reading / Recording frequency | <p>Parameter corresponds to the dispatch data operating margin grid emission factor and it was calculated yearly as per TOOL07 "Tool to calculate the emission factor for an electricity system". This parameter takes into account the hourly values of parameter $EF_{EL-DD,h}$ published by Brazilian DNA and the parameters electricity generation and electricity consumption. The calculation was carried out by applying the equation 12 of the TOOL07. The data applied for the parameter $EG_{PJ,h}$ in this formula was data from electricity generation when calculating the $EF_{OM-DD,y}$^{/9-3/} for <u>generation</u> and data from electricity consumption when calculating $EF_{OM-DD,y}$</p> | |

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| | | for <u>consumption</u> . Therefore, the calculations were carried out in accordance with registered PDD and applied TOOL07. |
| | 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? | <p>The values of the MR were verified their consistency with aggregated values of the Excel spreadsheets^{/8-2/} and with the evidences provided for its calculation ^{/17/}. As the calculation provided was not correct a CAR has been raised. Refer to CAR 02.</p> <p>After findings conclusion it has been observed that the values applied in the ER calculations^{/9-2/} are determined in accordance with current PDD and applied TOOL07</p> |
| | If applicable, has the reported data been crosschecked with other available data? | Values used in the calculation were checked against evidences provided. ^{/17/} |

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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 02.0? | 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 2020 – Summary of Final Report (base year 2019 ^{/18/}), which is an official publication. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | As the monitoring frequency set in the monitoring plan in annual, a CL has been raised. Refer to CL 04 After finding resolution, it has been clarified that the 2020 report ^{/18/} contains values from 2019 and it is the latest available data, which could be confirmed by the verification team. As the project was operational only from 2019 (see explanation in section A of this report), the values from 2019 were applied for 2019 and 2020 as the latest available data. |
| | 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 | N/A |

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| | 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? | The values of the MR were verified their consistency with Brazilian Energy Balance 2020 – Summary of Final Report (base year 2019). |
| | 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 02.0? | N/A |
| | 4. $EC_{PJ1,y} = EG_{EC1,y}$: Quantity of electricity consumed by the project activity during the year y | |
| | Criteria/Requirements | Assessment/Observation |
| Measuring / Reading / Recording frequency | This parameter corresponds to the electricity consumed from grid by the project activity. The quantity of electricity imported is continuously monitored by a bidirectional electricity meter, in accordance with TOOL05. The measurement are carried out in the SE Jaboatão II. | |
| Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes | |
| Monitoring equipment | The electricity is monitored by a bidirectional electricity meter. The technical data are as follows: Model: ION 8650 Manufacturer: Schneider Electric Serial Number: - MW-1807A325-02 | |

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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? | Accuracy class 0.2. The accuracy of the electricity meter is in accordance with national standards ^{/19-1/} and as per the manufacturer's specification ^{/20/} . |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | Accuracy class of the electricity meter is valid for the entire range. |
| | Calibration frequency / interval | 5 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 and it is set as per Brazilian regulations ^{/19-2/} . |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | An accredited institution has carried out calibration of equipment ^{/21/} . |
| | Is(are) the calibration(s) valid for the entire reporting period? | Yes. For details on the calibration. Refer to section E.7 below. |
| | 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 values of the Excel spreadsheets for parameter $PE_{EC,y}$. |
| | If applicable, has the reported data been crosschecked with other available data? | The values of the MR were reviewed during the site visit, which were compared to the raw data ^{/14-2/} directly downloaded from E-meter supervisory and crosschecked with reports ^{/22/} generated by CCEE ⁶ (official commercialization data). |
| | 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 02.0? | N/A | |

⁶ Electric Energy Commercialization Chamber

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| | 5. $EC_{PJ2,y} = EG_{EC2,y}$: Quantity of electricity consumed from diesel generator by the project activity during the year y | |
| | Criteria/Requirements | Assessment/Observation |
| | Measuring / Reading / Recording frequency | No diesel generator is currently installed during the monitoring period. Therefore this parameter is not applicable. This information was evidenced through on-site inspection. |
| | 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 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 | 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 02.0? | |
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| | 6. Management of SWDS | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | The parameter corresponds to the comparison between the originally conceived construction and operation of the landfill with the actual operation. This parameter is yearly compared based on original design of Landfill, technical specifications and national regulations. As per evidence provided ^{/23-1/} , no changes in the operation of the landfill is being observed. |
| | 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 |

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| | How were the values in the monitoring report verified? | Interviews, site visit and supporting evidences |
| | 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 02.0? | N/A |
| | 7. $EG_{PJ,y} = EC_{BL,k,y}$: Amount of electricity generated using LFG by the project activity in year y | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | This parameter corresponds to the electricity generated by the project activity and injected in the National grid. The electricity is generated during this monitoring period by 10 electricity generators with installed capacity equal to 1,426 kW each totalizing an installed capacity equal to 14,260 kW. The electricity generated is continuously monitored by a bidirectional electricity meter, in accordance with TOOL05. The measurement is carried out in the SE Jaboatão II. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| | Monitoring equipment | The electricity is monitored by a bidirectional electricity meter. The technical data are as follows: Model: ION 8650 Manufacturer: Schneider Electric Serial Number: - MW-1807A325-02 |
| | 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? | Accuracy class 0.2. The accuracy of the electricity meter is in accordance with national standards and as per the manufacturer's specification ^{/19-1/} . |
| Is the accuracy valid for the entire measuring range or do different | Accuracy class of the electricity meter is valid for the entire range. | |

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| | accuracy levels apply to different measuring ranges? | |
| | Calibration frequency / interval | 5 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 and it is set as per Brazilian regulations ^{19-2/} . |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | An accredited institution has carried out calibration of equipment ^{21/} . |
| | Is(are) the calibration(s) valid for the entire reporting period? | Yes. For details on the calibration. Refer to section E.7 below. |
| | 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 values of the Excel spreadsheets for parameter $PE_{EC,y}$. |
| | If applicable, has the reported data been crosschecked with other available data? | The values of the MR were reviewed during the site visit, which were compared to the raw data ^{14-3/} directly downloaded from E-meter supervisory and crosschecked with reports ^{22/} generated by CCEE ⁷ (official commercialization data). |
| | 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 02.0? | N/A |
| 8. $O_{pi,h}$: Operation of the equipment that consumes the LFG | | |
| Criteria/Requirements | Assessment / Observation | |
| Measuring / Reading / Recording frequency | The parameter corresponds to the determination whether the devices that consume LFG are or not operating. The parameter is continuously monitored and recorded automatically by Landtec supervisory system, every minute ⁸ . For flare, a flame detection system was installed and for the engines, the | |

⁷ Electric Energy Commercialization Chamber

⁸ It is important to point out that although values are recorded every minute, there are minutes that are missing. For these, please refer to CAR 3 item 3 in Appendix 4.

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| | electricity generated determines the operation or not. The value of the parameter is either 0 or 1 corresponding to OFF or ON respectively. |
| Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| Monitoring equipment | Flame detector and generation of electricity recorded by plant supervisory ^{14/} |
| 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 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 | N/A |

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| | 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 02.0? | |
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| | 9. $V_{t,db}$: Volumetric flow of the gaseous stream in time interval t on a dry basis | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | The parameter corresponds to the flow of the residual gas that is collected from the landfill and directed to flare and engines. The total value is the sum of both streams. The flow is continuously monitored by two flow meters and recorded every minute ⁹ . The parameter has been monitored in dry basis taking into account that the temperature of the LFG is below 60°C (Option A of TOOL08). This temperature is continuously measured by a thermocouple integrated to the flow meter and recorded by the plant supervisory ^{14-1/} . This parameter is the same as the $V_{RG,m}$ |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| Monitoring equipment | 02 flow meters installed in parallel: one for flare and other for engines, as follows <u>Flare (FT 04 flare 1)</u> <ul style="list-style-type: none"> - Manufacturer: ABB - Model: TrioWirl ST42 - Serial number: – 242540862/X001. <u>Engines (FT03 main line)</u> <ul style="list-style-type: none"> - Manufacturer: Fluid Component International (FCI) - Model: ST51 - Serial number: <ul style="list-style-type: none"> o 662114 until 31/01/2020 o 678921 from 01/02/2020 | |
| 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 FCI is $\pm 2\%$ as per equipment manual ^{1/20-2/} and equal to 0.5% for ABB flow meter as per calibration certificate ^{20-2/} . | |

⁹ It is important to point out that although values are recorded every minute, there are minutes that are missing. For these, please refer to CAR 3 item 3 in Appendix 4.

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| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | Accuracy class is valid for the entire range. |
| | Calibration frequency / interval | 18 months for FCI/ ^{20-2-b-i/} and 3 years/ ^{20-2-b-ii/} for ABB. However as the calibration frequency of the FCI meter informed in the MR is not in accordance with evidence provided a CAR has been raised. Refer to CAR 1 below. |
| | 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/ ^{21/} . |
| | Is(are) the calibration(s) valid for the entire reporting period? | Yes. For calibration details, refer to section E.7 below. |
| | 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 100% of the data submitted in daily spreadsheets downloaded directly from the DSS Drives server during site visit against data used in ER calculations spreadsheet. In order to aggregate all daily spreadsheets, an Excel technique has been used. |
| | 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 02.0? | N/A |
| 10. $V_{i,t,db}$: Volumetric fraction of greenhouse gas i in a time interval t on a dry basis | | |
| Criteria/Requirements | Assessment / Observation | |
| Measuring / Reading / Recording frequency | The parameter refers to the fraction of CH ₄ in the residual gas in dry basis. It is | |

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| | | <p>continuously read, measured and recorded every minute¹⁰ automatically by the company's supervisory system and aggregated and reported.</p> <p>The parameter has been monitored in dry basis taking into account that the temperature of the LFG is below 60°C (Option A of TOOL08). This temperature is continuously measured by a thermocouple integrated to the flow meter and recorded by the plant supervisory^{14//}.</p> <p>This parameter is the same as $V_{i,RG,m}$</p> |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| | Monitoring equipment | <p>01 residual gas analyser installed after the blowers:</p> <ul style="list-style-type: none"> - Manufacturer: Siemens - Model: Ultramat 23 - Serial number: N1H8060. |
| | 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 $\pm 2\%$ as per the manual ^{20-3/} 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 ^{20-3/} |
| | 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. For calibration details refer to section E.7 below |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | Yes. |

¹⁰ It is important to point out that although values are recorded every minute, there are minutes that are missing. For these, please refer to CAR 3 item 3 in Appendix 4.

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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 100% of the data submitted in daily spreadsheets downloaded directly from the DSS Drives server during site visit against data used in ER calculations spreadsheet. In order to aggregate all daily spreadsheets, an Excel technique has been used. |
| | 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 02.0? | N/A |
| | | |
| 11. 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 two thermocouples (TT06 – generator's line and TT07 flare's line). This equipment is used for measure the LFG temperature in order to determine whether the flow can be considered in dry basis (i.e. below 60°C). It is recorded at raw data spreadsheets ^{14/} . | |
| Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes | |
| Monitoring equipment | 02 thermal flow meter (one for the generator's line – TT06 – and one for the flare's line – TT07) <u>TT06</u> - Manufacturer: Fluid Component International (FCI) - Model: ST51 - Serial number: o 662114 until 30/01/2020 o 678921 from 31/01/2020 <u>TT07</u> - Manufacturer: Metron - Model: RTC-2652 - Serial number: 171963521 | |

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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? | <p>The accuracy of the equipment FCI is $\pm 2\%$ as per equipment manual^{/20-4/}</p> <p>The accuracy of the equipment RTC-2652 (Metron) is $\pm 0.1\%$ as per equipment manual^{/20-4/}</p> |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | Accuracy class is valid for the entire range. |
| | Calibration frequency / interval | <p>TT06 - 18 months ^{/20-4, a/}. However, as the calibration frequency informed in the MR is not in accordance with evidences provided, a CAR has been raised.</p> <p>Refer to CAR 1 below.</p> <p>TT07: 2 years as per email from manufacturer^{/20-4, b/}</p> |
| | 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. For calibration details, refer to section E.7 below. |
| | 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 100% of the data submitted in daily spreadsheets downloaded directly from the DSS Drives server during site visit against data used in ER calculations spreadsheet. In order to aggregate all daily spreadsheets, an Excel technique has been used. |
| | 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 | N/A |

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| | 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 02.0? | |
| | 12. 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 the supervisory system and this parameter is to be used in order to adjust the flow to normal conditions if the flow measurement is not already taken at these conditions. As the flows are already being measured in Normal conditions, this parameter is not applicable. Moreover, this parameter is to be applicable for moisture content determination in case flow temperature is above 60°C. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| | Monitoring equipment | 01 pressure meter: - Manufacturer: Honeywell - Model: STG 73S - Serial number: S/N C4000005594899. |
| | 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 $\pm 0.02\%$ as per equipment's manual ^{/20-5/} . |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | Accuracy class is valid for the entire range. |
| | Calibration frequency / interval | 2 years ^{/20-5/} |
| | 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. | |

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| | Is(are) the calibration(s) valid for the entire reporting period? | Yes. For calibration details refer to section E.7 below |
| | 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 100% of the data submitted in daily spreadsheets downloaded directly from the DSS Drives server during site visit against data used in ER calculations spreadsheet. In order to aggregate all daily spreadsheets, an Excel technique has been used. |
| | 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 02.0? | N/A |
| 13. Status of biogas destruction device: 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 ¹¹ . This parameter determines whether the flare and/or the electricity generators are operative. If energy is being generated, the status of electricity generators are considered operative. And if the flare flame is on, the flare is considered operative. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| | Monitoring equipment | UV Flame detector and electricity generated by Gensets |
| | 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 | N/A |

¹¹ It is important to point out that although values are recorded every minute, there are minutes that are missing. For these, please refer to CAR 3 item 3 in Appendix 4.

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| | the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | |
| | 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? | Interviews and site visit. Moreover, the raw data ^{14/} has been checked whether flare and generators are providing measurement data. |
| | If applicable, has the reported data been crosschecked with other available data? | The values of the MR were reviewed by crosschecking 100% of the data submitted in daily spreadsheets downloaded directly from the DSS Drives server during site visit against data used in ER calculations spreadsheet. In order to aggregate all daily spreadsheets, an Excel technique has been used. |
| | 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 02.0? | N/A | |
| 14. Flame_m : 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 | |

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| | | supervisory system every minute ¹² . This parameter determines whether the flare is operative. If the flare flame is on, the flare is considered operative. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| | Monitoring equipment | UV 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 |
| | 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 site visit. Moreover, the raw data ^{14/} has been checked whether flare is providing measurement data. |
| | If applicable, has the reported data been crosschecked with other available data? | The values of the MR were reviewed by crosschecking 100% of the data submitted in daily spreadsheets downloaded directly from the DSS Drives server during site visit against data used in ER calculations spreadsheet. In order to aggregate all daily spreadsheets, an Excel technique has been used. |
| | Does the data management ensure correct transfer of data and reporting of emission reductions | Data management system was found to be reliable and appropriate. |

¹² It is important to point out that although values are recorded every minute, there are minutes that are missing. For these, please refer to CAR 3 item 3 in Appendix 4.

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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 02.0? | N/A |
| | 15. <i>Maintenance</i>: Maintenance events completed in year y | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | The parameter corresponds to the daily records of maintenance events ^{24/} , including details of person undertaken the work, parts replaced, serial numbers and calibration certificates. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| | Monitoring equipment | Records of maintenance |
| | 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 |

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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 02.0? | N/A |
| | 16. $T_{EG,m}$: Temperature in the exhaust gas of the enclosed flare in minute m | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | The parameter corresponds to the temperature of the flare exhausting gases. The parameter is continuously read, measured and recorded every minute ¹³ automatically by supervisory system and aggregated and reported. The monitoring is in accordance with applied tool and monitoring plan, as confirmed by the diagram of the flare. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| | Monitoring equipment | 01 thermocouple at a time <ul style="list-style-type: none"> - Manufacturer ELSI - Type S - S/N: 08-14/67559 - Operated until 14/08/2019 Replaced by <ul style="list-style-type: none"> - Manufacturer ECIL - Type K - S/N: N1922.933353 - Operated from 15/08/2019 |
| | 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 ELSI is 1.5C or +/- 0.25% (whichever is greater) ^{20-6/} . and the accuracy of equipment ECIL is equal to +/- 2.2C or +/- 0.75% (whichever is greater) ^{20-6/} |

¹³ It is important to point out that although values are recorded every minute, there are minutes that are missing. For these, please refer to CAR 3 item 3 in Appendix 4.

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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 | 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 ^{20-6/} . |
| | 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? | There was observed delays in calibration of the monitoring equipment. For details, refer to section E.7 below. |
| | 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 100% of the data submitted in daily spreadsheets downloaded directly from the DSS Drives server during site visit against data used in ER calculations spreadsheet. In order to aggregate all daily spreadsheets, an Excel technique has been used. |
| | 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 02.0? | N/A |
| 17. $V_{i,RG,m}$: Volumetric fraction of component i in the residual gas on a dry basis in the minute m where $i = \text{CH}_4, \text{CO}, \text{CO}_2, \text{O}_2, \text{H}_2, \text{H}_2\text{S}, \text{NH}_4, \text{N}_2$ | | |
| Criteria/Requirements | Assessment / Observation | |
| Measuring / Reading / Recording frequency | The parameter refers to the fraction of CH_4 in the residual gas in dry basis. It is continuously read, measured and | |

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| | | <p>recorded every minute ¹⁴ automatically by the company's supervisory system and aggregated and reported. As a simplification allowed by TOOL06 paragraph 34, the CH₄ fraction is determined and the difference from 100% is pure Nitrogen.</p> <p>The parameter has been monitored in dry basis taking into account that the temperature of the LFG is below 60°C (Option A of TOOL08). This temperature is continuously measured by a thermocouple integrated to the flow meter and recorded by the plant supervisory^{14/}.</p> <p>This parameter is the same as $V_{i,t,db}$</p> |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| | Monitoring equipment | <p>01 residual gas analyser installed after the blowers:</p> <ul style="list-style-type: none"> - Manufacturer: Siemens - Model: Ultramat 23 - Serial number: N1H8060. |
| | 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 $\pm 2\%$ ^{20-3/} 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 ^{20-3/} |
| | 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. For calibration details refer to section E.7 below |

¹⁴ It is important to point out that although values are recorded every minute, there are minutes that are missing. For these, please refer to CAR 3 item 3 in Appendix 4.

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| | 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 100% of the data submitted in daily spreadsheets downloaded directly from the DSS Drives server during site visit against data used in ER calculations spreadsheet. In order to aggregate all daily spreadsheets, an Excel technique has been used. |
| | 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 02.0? | N/A |
| | 18. $V_{RG,m}$: Volumetric flow of the residual gas on a dry basis at reference conditions in the minute m | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | The parameter corresponds to the flow of the residual gas that is collected from the landfill and directed to flare and engines. The total value is the sum of both streams. The flow is continuously monitored by two flow meters and recorded every minute ¹⁵ . The parameter has been monitored in dry basis taking into account that the temperature of the LFG is below 60°C (Option A of TOOL08). This temperature is continuously measured by a thermocouple integrated to the flow meter and recorded by the plant supervisory ^{14/} . This parameter is the same as the $V_{t,db}$ |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| | Monitoring equipment | 02 flow meters installed in parallel: one for flare and other for engines, as follows |

¹⁵ It is important to point out that although values are recorded every minute, there are minutes that are missing. For these, please refer to CAR 3 item 3 in Appendix 4.

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| | <p><u>Flare (FT 04 flare 1)</u></p> <ul style="list-style-type: none"> - Manufacturer: ABB - Model: TrioWirl ST42 - Serial number: – 242540862/X001. <p><u>Engines (FT03 main line)</u></p> <ul style="list-style-type: none"> - Manufacturer: Fluid Component International (FCI) - Model: ST51 - Serial number: <ul style="list-style-type: none"> o 662114 until 30/01/2020 o 678921 from 31/01/2020 |
| 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 FCI is $\pm 2\%$ as per equipment manual ^{/20-2/} and equal to 0.5% for ABB flow meter as per calibration certificate ^{/20-2/} . |
| Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | Accuracy class is valid for the entire range. |
| Calibration frequency / interval | <p>18 months for FCI^{/20-2-i/} and 3 years^{/20-2-ii/} for ABB. However as the calibration frequencies mentioned in the MR are not in accordance with evidences provided, a CAR has been raised.</p> <p>Refer to CAR 1 below.</p> |
| 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. For calibration details, refer to section E.7 below. |
| 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 100% of the data submitted in daily spreadsheets downloaded directly from the DSS Drives |

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| | | server during site visit against data used in ER calculations spreadsheet. In order to aggregate all daily spreadsheets, an Excel technique has been used. |
| | 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 02.0? | N/A |
| 19. $M_{RG,m}$: Mass flow of the residual gas on a dry basis at reference conditions in the minute m | | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | The mass flow is calculated based on the volumetric flow (parameter $V_{RG,m}$) in accordance to TOOL06. The parameter is calculated every minute ¹⁶ based on the continuously monitoring of volumetric flow. |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes. |
| | Monitoring equipment | Not applied as the parameter is calculated. |
| | 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? | Not applied as the parameter is calculated. |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | Not applied as the parameter is calculated. |
| | Calibration frequency / interval | Not applied as the parameter is calculated. |
| | 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 | Not applied as the parameter is calculated. |

¹⁶ It is important to point out that although values are recorded every minute, there are minutes that are missing. For these, please refer to CAR 3 item 3 in Appendix 4.

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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? | Not applied as the parameter is calculated. |
| | Is(are) the calibration(s) valid for the entire reporting period? | Not applied as the parameter is calculated. |
| | Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out? | Not applied as the parameter is calculated. |
| | How were the values in the monitoring report verified? | The calculations have been checked and compared to information provided in the PDD and TOOL06. |
| | If applicable, has the reported data been crosschecked with other available data? | The calculations have been checked. Raw data used for calculations has been directly downloaded from supervisory. |
| | 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 02.0? | N/A |
| 20. $V_{O_2,EG,m}$: Volumetric fraction of O₂ in the exhaust gas on a dry basis at reference conditions in the minute m | | |
| Criteria/Requirements | Assessment / Observation | |
| Measuring / Reading / Recording frequency | <p>The parameter refers to the Oxygen fraction in the exhaust gas of the flare. It is continuously read, measured and recorded every minute¹⁷ automatically by supervisory system and aggregated and reported.</p> <p>The equipment has a programmed point of measurement (sampling point) at the upper section of the flare (80% of total flare height).</p> | |
| Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes | |
| Monitoring equipment | <p>01 exhaust gas analyser</p> <ul style="list-style-type: none"> - Manufacturer: Siemens - Model: Ultramat 23 - Serial number: N1C7779. | |

¹⁷ It is important to point out that although values are recorded every minute, there are minutes that are missing. For these, please refer to CAR 3 item 3 in Appendix 4.

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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? | <p>The accuracy of the equipment is $\pm 2\%$ for CH₄ and $\pm 0.05\%$ for O₂ as per its manual^{1/20-7/} and in accordance with the registered monitoring plan.</p> <p>It is important to highlight that although accuracy of equipment for O₂ is equal to 0.05%, the applied correction factor was equal to 0.2% as it was the error achieved in the subsequent calibration certificate.</p> |
| | 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 ^{r/20-7/} |
| | 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? | During the current monitoring period, delays in calibration have been observed. Refer to section E.7 for details. |
| | 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 100% of the data submitted in daily spreadsheets downloaded directly from the DSS Drives server during site visit against data used in ER calculations spreadsheet. In order to aggregate all daily spreadsheets, an Excel technique has been used. |
| | 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 02.0? | |
| | 21. $f_{CH_4,EG,m}$: Concentration of methane in the exhaust gas of the flare on a dry basis at reference conditions in the minute m | |
| | Criteria/Requirements | Assessment / Observation |
| | Measuring / Reading / Recording frequency | <p>The parameter refers to the Methane fraction in the exhaust gas of the flare. It is continuously read, measured and recorded every minute¹⁸ automatically by supervisory system and aggregated and reported.</p> <p>The equipment has a programmed point of measurement (sampling point) at the upper section of the flare (80% of total flare height).</p> |
| | Is the measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? | Yes |
| | Monitoring equipment | <p>01 exhaust gas analyser</p> <ul style="list-style-type: none"> - Manufacturer: Siemens - Model: Ultramat 23 - Serial number: N1C7779. |
| | 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 CH ₄ and $\pm 0.05\%$ for O ₂ as per its manual ^[20-7] 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 ^[20-7] |
| | 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? | During the current monitoring period, delays in calibration have been | |

¹⁸ It is important to point out that although values are recorded every minute, there are minutes that are missing. For these, please refer to CAR 3 item 3 in Appendix 4.

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| | | observed. Refer to section E.7 for details. |
| | 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 100% of the data submitted in daily spreadsheets downloaded directly from the DSS Drives server during site visit against data used in ER calculations spreadsheet. In order to aggregate all daily spreadsheets, an Excel technique has been used. |
| | 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 02.0? | N/A |
| <p>Note: the following parameters, although part of the registered monitoring plan, have not been monitored during the present monitoring period as they have not been used:</p> <ol style="list-style-type: none"> 1. $V_{t,wb}$: Volumetric flow of the gaseous stream in time interval t on a wet basis. PA determines this parameter in dry basis 2. $V_{i,t,wb}$: Volumetric fraction of greenhouse gas i in a time interval t on a wet basis. PA determines this parameter in dry basis 3. $P_{H_2O,t,Sat}$: Saturation pressure of H_2O at temperature T_t in time interval t. As the pressure measurements are determined at normal conditions (see fixed parameter P_{ref}), this parameter is not applicable. <p>During the monitoring period, there were events due to maintenance, which not necessarily interrupted the operation of the project activity. The events are described at the MR in accordance with PP's operation records. As it is not clear the application of the monitoring frequency to the parameter TDLy, a CL has been raised.</p> | | |
| Findings | <p>CL 04</p> <p><i>MR section D.2 – TDL: the monitoring plan of registered PDD sets an annual monitoring frequency. Nevertheless, the MP covers 3 different years and just the value of 2019 is being used.</i></p> | |
| Conclusion | <p>The registered monitoring plan has been properly implemented and followed by the project participants.</p> <p>In addition, the parameters have been monitored in a correct and conservative way.</p> <p>Quality assurance and quality control procedures are in place.</p> <p>Therefore, the VT has concluded that the monitoring of the project activity is in accordance with the registered monitoring plan.</p> | |

E.6.3. Implementation of sampling plan

| | |
|------------------------------|--|
| 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 calibration requirements of measuring equipment. | | | | | |
| | The list of equipment, as wells as their calibration dates and calibration validity are as follows: | | | | | |
| | Equipment /model | Parameter | Serial # / accuracy | Calibration frequency ^{/20/} | Calibration dates | Delay |
| | Gas analyzer / Ultramat 23 | V _{i,t,db} V _{i,RG,m} Residual gas | N1H8060 Accuracy: +/- 2% | annual | 18/01/2019 07/02/2020 | 18/01/2020 to 06/02/2020 |
| | Gas analyzer / Ultramat 23 | V _{O2,EG,m} (O ₂) f _C CH _{4,EG,m} (CH ₄) exhaust gas | N1C7779 Accuracy: ± 2% for CH ₄ and ± 0.05 ¹⁹ % for O ₂ | annual | 22/01/2019 07/02/2020 | 22/01/2020 to 06/02/2020 |
| | Electricity meter / ION 8650 | EC _{PJ1,y} EG _{PJ,y} | MW1807A32 5-02 Accuracy 0.2 | 5 years | 22/11/2018 | No |
| | Flowmeter / ST51 | V _{t,db} V _{RG,m} Flow to generator s (main line FT03) | 662114 (operating until /24-3-a/ 30/01/2020) Accuracy: +/- 2% | 1.5 years | 19/11/2018 | No |
| | | | 678921 (operating from /24-3-a/ 31/01/2020) Accuracy: +/- 2% | | 18/11/2019 | No |
| | Flowmeter / TRIO WIRL ST42 | V _{t,db} V _{RG,m} Flow to flare (Flare 1 FT04) | 242540862/X001 Accuracy: +/- 0.5% | 3 years | 25/08/2017 | No |
| Thermocouple /ST51 | T _t (TT06 – main line | 662114 (operating | 1.5 years | 19/11/2018 | No | |

¹⁹ Correction factor of 0.2% was applied to the delayed period as it was the error identified in the subsequent calibration certificate^{21-7/}

| | | | | | | |
|---|--|--------------------------------------|---|---------|----------------------------------|--|
| | | to engines) | until /24-3-a/ 30/01/2020) Accuracy: +/- 2% | | | |
| | | | 678921 (operating from /24-3-a/ 31/01/2020) Accuracy: +/- 2% | | 18/11/2019 | No |
| | Thermocouple /RTC-2652 | T _t (TT07 – flare) | 171963521 Accuracy: +/- 0.1% | 2 years | 07/11/2019 | 26/07/2019 to 06/11/2019 |
| | Pressure meter / STG 73S | P _t (PT 05 to both lines) | C400000559 4899 Accuracy: +/- 0.02% | 2 years | 19/06/2018 | No |
| | Thermocouple / Type K and Type S | T _{EG,m} | 8-14/67559 (type S) (operating until 14/08/2019) Accuracy: +/- 1.5C or +/- 0.25% | 1 year | No calibration during the period | 29/09/2018 to 14/08/2019 ²⁰ |
| | | | N1922.933353 Type K (Operating from 15/08/2019) Accuracy: +/- 2.2C or +/- 0.75% | 1 year | 23/07/2019 | No |
| As the calibration frequency mentioned in the MR are not in accordance with evidences provided a CAR has been raised. Refer to CAR 1. Moreover some delays in calibration were observed and the provisions from VVS para 369 were not applied. Refer to CAR 3 item 5) in section E.8.1 below. | | | | | | |
| Findings | CAR 1 <i>Calibration frequency of flowmeter S/N 662114 and S/N 678921 that measure the residual gas to engines (parameters V_{t,db} and V_{RG,m} and T_t) is not in accordance with evidences provided.</i> For CAR 3 refer to section E.8.1 below and Appendix 4. | | | | | |
| Conclusion | Not all measuring equipment have been duly calibrated for the complete monitoring period. The following equipment presented delays in calibration: - Gas analyser / Ultramat 23 S/N N1H8060 - Gas analyser / Ultramat 23 S/N N1C7779 - Thermocouple Type S S/N 8-14/67559 - Thermocouple RTC 2652 (PT100) S/N 171963521 | | | | | |

²⁰ Delays were applied in the ER calculations from 26/07/2019 as it is the date which Flare started its operation in this monitoring period.

| | |
|--|---|
| | <p>The maximum permissible error of the instruments have been conservatively applied to the delayed period. These correction factor has been applied to the measured values taken during the period of delayed calibration, as the results of the delayed calibrations do not show any errors or the errors were smaller than the maximum permissible errors in the measuring of all equipment, in accordance with paragraph 369 (a) of the VVS for project activities – version 02.0. An exception occurred to the exhaust gas analyser for O₂ where the accuracy was equal to 0.05% and the error observed in calibration was equal to 0.2%. Therefore the higher correction factor has been applied.</p> <p>The application of correction factor are duly traceable in the monthly calculation spreadsheet⁽⁹⁻¹⁻ⁱ⁾ which are considered correct and conservative by the verification team (reduction of ERs were seek when applying correction factors). The correction factors were applied to all days which calibration was delayed.</p> |
|--|---|

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

| | |
|-----------------------|---|
| 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 in year y; - $BE_{EC,y}$; baseline emissions associated with electricity generation in year y; $BE_{CH_4,y} = ((1 - OX_{top_layer}) \times F_{CH_4,PJ,y} - F_{CH_4,BL,y}) \times GWP_{CH_4}$ <p>Where</p> <p>OX_{Top_layer} = Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline</p> <p>$F_{CH_4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used in the project activity in year y (tCH₄/yr)</p> <p>$F_{CH_4,BL,y}$ = amount of methane that would have been captured and destroyed (by flaring) in the baseline in year y (tCH₄/yr)</p> <p>GWP_{CH_4} = Global warming potential of CH₄ (t CO₂e/t CH₄)</p> <p>The parameter $F_{CH_4,PJ}$, accounts for two components: $F_{CH_4,flared,y}$ and $F_{CH_4,EL,y}$</p> <p>Where</p> <p>$F_{CH_4,flared,y}$ = Amount of methane in the LFG which is destroyed by flaring in year y (t CH₄/yr)</p> <p>$F_{CH_4,EL,y}$ = Amount of methane in the LFG which is used for electricity generation in year y (t CH₄/yr)</p> $F_{CH_4,flare,y} = F_{CH_4,sent_{flare,y}} - \frac{PE_{flare,y}}{GWP_{CH_4}}$ <p>Where</p> <p>$F_{CH_4,sent_flared,y}$ = Amount of methane in the LFG which is sent to flare in year y (t CH₄/yr)</p> <p>$PE_{flare,y}$ = Project emissions from flaring of the residual gas stream in year y (t CO₂e/yr)</p> <p>The $PE_{flare,y}$ is continuously measured every minute in accordance with TOOL06.</p> |
|-----------------------|---|

And

$$BE_{EC,y} = EC_{BL,k,y} \times EF_{EL,k,y} \times (1 + TDL_y)$$

$EC_{BL,k,y} = EG_{PJ,y}$ = Net amount of electricity generated using LFG in year y (MWh/yr)

$EF_{EL,k,y}$ = Emission factor for electricity generation for source k in year y (tCO₂e/MWh)

TDL_y = Average technical transmission and distribution losses for providing electricity to source k in year y

$EF_{EL,k,y}$, in case of this project activity, is equal to $EF_{grid,CM}$ (Combined Margin Grid emission Factor), calculated as per TOOL07 where the parameter EF_{BM} is fixed ex-ante for this CP and the EF_{OM-DD} is determined in accordance with mentioned tool ex-post.

The Combined margin emission factor of the grid ($EF_{grid,CM,y}$) was calculated as follows:

$$EF_{grid,CM,y} = EF_{OM} \times w_{OM} + EF_{BM} \times w_{BM}$$

Where w_{OM} and w_{BM} are the Operating margin weight is fixed as 0.75 and the build margin weight is fixed as 0.25 as per applied tool for calculating emission factor for an electricity system.

For the determination of $EF_{OM-DD,y}$ the PP applied the parameters provided by the Brazilian DNA^{/17/}. The $EF_{OM-DD,y}$ was calculated with the hourly dispatch emission factor of the grid and with the hourly electricity generation of the project activity as follows:

$$EF_{OM-DD,y} = \frac{\sum EF_{EL-DD,h} \times EG_{PJ,h}}{EG_{PJ,y}}$$

Where:

$EF_{OM-DD,y}$ = Dispatch data analysis operating margin CO₂ emission factor in year y

$EF_{EL-DD,h}$ = CO₂ emission factor for power units in the top of the dispatch order in hour h in year y

$EG_{PJ,h}$ = Electricity displaced by the project activity in hour h of year y

$EG_{PJ,y}$ = Total electricity displaced by the project activity in year y.

It has been observed that the grid emission factor calculations were not made in accordance with PDD. Moreover, some inconsistencies in the ER calculation spreadsheet were found. Therefore, CARs have been raised.

Findings

CAR 02

The calculation of grid emission factor is not being carried out in accordance with PDD and TOOL07

CAR 03

ER calculations

1. The formula applied in the monthly ER calculations spreadsheet, tab 2020, column BY is not in accordance with TOOL06.
2. it is being observed that there is flow in the flare 2 (for example From 31/07/2019 at 16:12 tab 2020 column BQ). Nevertheless, only one flare is installed during the monitoring period as informed to the verification team.
3. As per monitoring plan, the LFG data is to be measured every minute. It is required to explain why this frequency is not being followed in several dates (e.g. monthly spreadsheet 09-2019 tab raw data adjusted line 8644 to 8646, among others)
4. Raw data provided for 30/11/2019 and 01/12/2019 are not in accordance with data used in the ER calculations spreadsheet (monthly sheet).

| | |
|-------------------|--|
| | <p>5. For the period which exhaust gas analyser has its calibration delayed, the correction factor for O₂, although applied, is not being used in the ER calculations (monthly sheet, tab 2020 column BW).</p> |
| 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. <p>The baseline emissions results for the monitoring period are as follows:</p> $BE_{CH_4} = 161,599 \text{ tCO}_2\text{e}$ $BE_{EC} = 9,365 \text{ tCO}_2\text{e}$ $BE_y = 170,960 \text{ tCO}_2\text{e}$ |

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

| | |
|------------------------------|--|
| Means of verification | <p>Project emission estimation has been done in accordance with registered monitoring plan, applied methodology and tool. The equation used is as follows:</p> $PE_y = PE_{EC,y} + PE_{FC,y}$ <p>Where:</p> <ul style="list-style-type: none"> - $PE_{EC,y}$ = Emissions from consumption of electricity in the project case; - $PE_{FC,y}$ = Emissions from consumption of fossil fuels due to project activity, for purpose other than electricity generation, in year y. <p>For this project $PE_{FC,y} = 0$</p> <p>(1) $PE_{EC,y} = \sum_i EC_{PJ,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$, where:</p> <ul style="list-style-type: none"> - $EC_{PJ,y}$ = Quantity of electricity consumed by the project activity during the year y; - $EF_{EL,j,y}$ = Emission factor for the electricity grid in year y; - $TDL_{j,y}$ = Average technical transmission and distribution losses in the grid in year y. <p>Likely the baseline emissions, the Grid emission factor has been calculated as per requirements of TOOL07 but now for electricity consumption: The $EF_{OM-DD,y}$ was calculated with the hourly dispatch emission factor of the grid and with the hourly electricity consumption of the project activity as follows:</p> $EF_{OM-DD,y} = \frac{\sum EF_{EL-DD,h} \times EG_{EC,h}}{EG_{EC,y}}$ <p>Where:</p> <ul style="list-style-type: none"> $EF_{OM-DD,y}$ = Dispatch data analysis operating margin CO₂ emission factor in year y $EF_{EL-DD,h}$ = CO₂ emission factor for power units in the top of the dispatch order in hour h in year y $EG_{EC,h}$ = Electricity consumed by the project activity in hour h of year y $EG_{EC,y}$ = Total electricity consumed by the project activity in year y. <p>It has been observed that the grid emission factor calculations were not made in accordance with PDD. Therefore, a CAR has been raised.</p> |
|------------------------------|--|

| | |
|-------------------|--|
| Findings | Refer to CAR 1 above. |
| 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. <p style="text-align: right;">$PE_{EC} = PE_y = 10 \text{ tCO}_2\text{e}$</p> |

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.</p> <p>The verification team confirms an audit trail that contains the evidences and records of validated figures.</p> |
| Findings | - |
| 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 | <p>The actual emission reductions were checked against the estimates of the registered PDD. However considering that the plant started its operation after the start of the monitoring period, the comparison was not comparable. Therefore, a CL has been raised.</p> |
| Findings | <p>CL 05</p> <p><i>MR section E.5 and front page: as required by instructions for completing the MR, the comparison between the estimated ERs and the achieved during the MP are to be made with adjustment from the comparable period as appropriate. Considering that the plant was not operating from 29/09/2018 until 26/07/2019, the comparison is not being carried out in accordance with requirements.</i></p> |
| Conclusion | <p>The comparison of actual values of the monitoring period with the estimates in the registered PDD is now properly presented at the MR taken into account comparative periods.</p> |

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

| | |
|------------------------------|---|
| Means of verification | Comparable period is to be used for comparing estimated ERs at the registered PDD with actual achieved ERs. As this comparison has not being made, no conclusion can be given. |
| Findings | Refer to CL 02 in section E.8.5 above. |
| Conclusion | The periods compared between estimated and actual are now coherent and therefore the comparison is done correctly. As the actual achieved ERs are lower than the estimated in the registered PDD, no remarks are necessary. |

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 "CTR Candeias Landfill Gas Project" – Ref. 3958 for the monitoring period from 29/09/2018 to 02/03/2020 (including both days). Verified and certified emission reductions as per commitment period: | |
| | Commitment period | Amount |
| | Up to 31/12/2012 | 0 tCO ₂ e |
| | From 01/01/2013 until 31/12/2020 | 170,950 tCO ₂ |
| | From 01/01/2021 | 0 tCO ₂ e |
| Findings | N/A | |
| Conclusion | The total amount of GHG emissions reductions have been generated between 01/01/2013 and 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 09/02/2021. 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 SA, has performed the independent verification of the emission reductions for the CDM project activity “CTR Candeias Landfill Gas Project” – Ref.: 3958 – in Brazil, for the monitoring period from 29/09/2018 to 02/03/2020 (including both days) as reported in the draft Monitoring Report.

Haztec Tecnologia e Planejamento Ambiental SA 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, the monitoring plan contained in the valid version of PDD^{/10/} 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 completely implemented as per the description given in the registered PDD; and
- the actual operation conforms to the description in the registered PDD.

SECTION H. Certification statement

ESPL, contracted by Haztec Tecnologia e Planejamento Ambiental SA, has performed the independent verification of the emission reductions for the CDM project activity “CTR Candeias Landfill Gas Project” – Ref.: 3958 – in Brazil for the monitoring period from 29/09/2018 to 02/03/2020 (including both days), as reported in the final version of the Monitoring Report^{/07/}.

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 and the monitoring plan contained in the PDD.

ESPL is able to certify that the emission reductions of CDM project activity “CTR Candeias Landfill Gas Project”, during the present monitoring period, totalize the amount of **170,950 tCO₂e**.

Appendix 1. Abbreviations

| Abbreviations | Full texts |
|--------------------|---|
| ABNT | Brazilian Association of Technical Regulation |
| ACM | Approved Consolidated Methodology |
| BE | Baseline Emissions |
| BM | Build Margin |
| CAR | Corrective Action Request |
| CCEE | Commercialization Chamber 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 |
| CPRH | Environmental Agency of the State of Pernambuco |
| DNA | Designated National Authority |
| DOE | Designated Operational Entity |
| EB | Executive Board |
| EIA | Environmental Impact Assessment |
| ESPL | Earthood Services Private Limited |
| FAR | Forward Action Request |
| GHG | Green House Gas |
| GSC/GSP | Global Stakeholder Consultation Process |
| INMETRO | National Institute of Metrology, Quality and Technology |
| IPCC | Intergovernmental Panel on Climate Change |
| KP | Kyoto Protocol |
| LE | Leakage Emissions |
| LFG | Landfill gas |
| 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 |
| VVS | Validation and Verification Standard |

Appendix 2. Competence of team members and technical reviewers

| 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 ID, AMS-I.E, AMS-I.C, AM0026, AMS-I.A, AMS-I.F, AMS-III.H, AMS-III.I. GS: Ecologically Sound Fuel Switch to Biomass with Reduced Energy Requirement, GS: Technologies and Practices to Displace Decentralized Thermal Energy Consumption) | | |
| Local expert | Brazil, Chile, Honduras, Colombia | | |
| Financial Expert | Yes | | |
| Technical Reviewer | No | | |
| TA Expert | Yes (TA 1.1, 1.2, 4.1, 5.1, 9.1, 13.1) | | |
| Reviewed by | Shreya Garg | Date | 05/03/2020 |
| Approved by | Anshika Gupta | Date | 05/03/2020 |

| Competence Statement | | | |
|---------------------------|--|-------------|------------|
| Name | Shreya Garg | | |
| Country | India | | |
| Education | M.Sc. (Climate Science & Policy), TERI University | | |
| Experience | 6 Years + | | |
| Field | Climate Change | | |
| Approved Roles | | | |
| Team Leader | YES | | |
| Validator | YES | | |
| Verifier | YES | | |
| Methodology Expert | AMS.I.A., AMS.I.C., AMS.I.D., AMS.I.F., AMS.II.D., AMS.II.G., AMS.II.J., AMS.III.AV., ACM0002, ACM0012 | | |
| Local expert | YES (India) | | |
| Financial Expert | NO | | |
| Technical Reviewer | YES | | |
| TA Expert | YES (TA 1.2, TA 3.1) | | |
| Reviewed by | Abhishek Mahawar | Date | 01/03/2018 |
| Approved by | Ashok Gautam | Date | 01/03/2018 |

| 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., 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 | 23/10/2019 |
| Approved by | Anshika Gupta | Date | 23/10/2019 |

Appendix 3. Documents reviewed or referenced

| No. | Author | Title | References to the document | Provider |
|-----|--------|--|--|----------|
| 1. | UNFCCC | Standard: CDM PS for project activities | version 02.0 | Others |
| 2. | UNFCCC | Standard: CDM PCP for project activities | version 02.0 | Others |
| 3. | UNFCCC | Standard: CDM VVS for project activities | version 02.0 | Others |
| 4. | UNFCCC | Form: CDM-MR-FORM | version 08.0 | Others |
| 5. | PP | Monitoring Report (draft) | version 01 – 03/02/2021 | PP |
| 6. | PP | Monitoring Report (revised) | version 02 – 02/04/2021 version 03 – 13/04/2021 | PP |
| 7. | PP | Monitoring Report (final) | version 04 – 07/05/2021 | PP |
| 8. | PP | <u>ER and EF Spreadsheet (draft)</u> 1. <u>ER calculations</u> a. YYYY MM Candeias CERs_ALLCOT (monthly spreadsheets with detailed calculation) b. Candeias_Consolidated 6a VER 2. <u>Grid emission factor calculations</u> | v2 v2 V1 | PP |
| 9. | PP | <u>ER and EF Spreadsheet (final)</u> 1. <u>ER calculations</u> a. YYYY MM Candeias CERs_ALLCOT (monthly spreadsheets with detailed calculation) b. Candeias_Consolidated 6a VER 2. <u>Grid emission factor calculations</u> a. Candeias - Emission factor 6 ^a ver (values of EF _{OM,y} are stated in tabs “EFgrid DNA ‘YYYY’ ”) | V4 V5 V2.1 | PP |

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|-----|----------------|--|---|--------|
| 10. | PP | Registered PDD | version 23 – 16/12/2020 | Others |
| 11. | UNFCCC | <u>Methodology:</u> ACM0001 – Flaring or use of landfill gas | version 19 | Others |
| 12. | UNFCCC | <u>Methodological tools:</u> 1. TOOL02: Combined tool to identify the baseline scenario and demonstrate additionality | version 07.0 | Others |
| | | 2. TOOL03: Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion | version 03 | |
| | | 3. TOOL04: Emissions from solid waste disposal sites | version 08.0 | |
| | | 4. TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation | version 03.0 | |
| | | 5. TOOL06: Project emission from flaring | version 03.0 | |
| | | 6. TOOL07: Tool to calculate the emission factor for an electricity system | version 07.0 | |
| | | 7. TOOL08: tool to determine the mass flow of a greenhouse gas in a gaseous stream | version 03.0 | |
| 13. | Google Maps | <u>Geographical Coordinates of Project activity</u> Plot of project location in google maps in order to confirm the project location | https://www.google.com.br/maps/place/8%C2%B009'51.3%22S+34%C2%B0059'07.4%22W/@-8.1642527,-34.9875747,922m/data=!3m2!1e3!4b1!4m5!3m4!1s0x0:0x0!8m2!3d-8.164258!4d-34.985386 | DOE |
| 14. | PP CCEE | <u>Raw data</u> 1. Daily spreadsheets with all monitored parameters referred LFG measurement extracted directly from DSS Drives System 2. Macro (excel tool) used for aggregating daily spreadsheet with raw data 3. Monthly spreadsheets with hourly electricity measured (exported and imported) extracted from electricity meter | - | Other |
| 15. | ANEEL | <u>Approval of commercial operation of Electricity Generation units</u> 1. ANEEL Dispatch 2046 issued on 25/07/2019 for Generation units from #1 to #8 | Approval date from 26/07/2019 Approval date from 12/11/2019 | PP |

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|-----|-------|--|--|--|
| | | <p>2. ANEEL Dispatch 3135 issued on 11/11/2019 for Generation units from #9 to #10</p> <p>3. ANEEL Dispatch 2852 issued on 05/10/2020 for Generation unit #11 (unit started its commercial operation after the end of the current MP, but it was already installed during the on-site inspection)</p> | Approval date from 06/10/2020 | |
| 16. | INNIO | <p><u>Equipment Acceptance report (commissioning approval)</u></p> <p>1. Order 35070 regarding Design number X464 (generation Unit # 1)</p> <p>2. Order 35072 regarding Design number X466 (generation Unit # 2)</p> <p>3. Order 35077 regarding Design number X468 (generation Unit # 3)</p> <p>4. Order 35086 regarding Design number X470 (generation Unit # 4)</p> <p>5. Order 34898 regarding Design number X471 (generation Unit # 5)</p> <p>6. Order 35081 regarding Design number X472 (generation Unit # 6)</p> <p>7. Order 34899 regarding Design number X465 (generation Unit # 7)</p> <p>8. Order 35082 regarding Design number X473 (generation Unit # 8)</p> <p>9. Order 35076 regarding Design number X467 (generation Unit # 9)</p> <p>10. Order 323485 regarding Design number Y963 (generation Unit # 10)</p> <p>11. Order 44652 regarding Design number JAC59 (generation</p> | <p>Approval date</p> <p>30/07/2019</p> <p>30/07/2019</p> <p>30/07/2019</p> <p>08/08/2019</p> <p>08/08/2019</p> <p>08/08/2019</p> <p>08/08/2019</p> <p>22/08/2019</p> <p>07/11/2019</p> <p>12/11/2019</p> <p>08/10/2020</p> | |
| | GE | | | |

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|-----|--|---|---|-------|
| | | Unit # 11) (installed after the end of this MP) | | |
| 17. | MCTIC | Data provided by the Brazilian DNA website regarding the EF _{OM-DD,h} and EF _{BM,y} | https://antigo.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/texto_geral/emissao_despacho.html | Other |
| 18. | EPE | National Energy Balance 2020. (26.3% for 2019 is the most recent data) – Summary report 2020 pg 15 issued by EPE (National Company of Energetic Research) on May /2020: Search in “Relatório Síntese 2020”\Arquivos\Relatório Síntese BEN 2020 | https://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/balanco-energetico-nacional-2020 | Other |
| 19. | ONS (National Electric System Operator) | <ol style="list-style-type: none"> 1. Procedure 12.2 from ONS (National Electric System Operator) regulating the accuracy class of the electricity meters 2. Regulation (ONS Grid Procedure, submodule 12.3) stating 5 years calibration frequency is to be applied to electricity meters | - | Other |
| 20. | <p>Schneider Electric</p> <p>FCI ABB</p> | <p><u>Technical information of meters used in the PA</u></p> <ol style="list-style-type: none"> 1. <u>Electricity meter</u> <ol style="list-style-type: none"> a. Accuracy: Technical report Electricity meter ION8650 stating the accuracy class equal to 0.2 (pg 5) b. Calibration frequency: National regulation^{19-2/} 2. <u>Flow meter:</u> <ol style="list-style-type: none"> a. Accuracy: <ol style="list-style-type: none"> i. FCI technical report (ST51-Guide) stating accuracy equal to 2% ii. ABB flow meter: accuracy stated in the calibration certificate b. Calibration frequency: <ol style="list-style-type: none"> i. FCI: ST51-IOM-Guide-06EN003389a_Frequencia de calibração | - | Other |

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|-----|--|---|--|----|
| | | <p>pressure - STG700 Smart Pressure Transmitter, issued by Honeywell on Jan/2021, stating 2 years of calibration frequency.</p> <p>6. <u>Thermocouple (exhaust gas)</u></p> <p>a. Accuracy: According to standard ASTM E230/E230M and ASTM E680/E680M</p> <p>b. Calibration frequency: Email issued by ECIL on 26/02/2019 stating calibration frequency equal to 1 year</p> <p>7. <u>Gas Analyser (exhaust gas)</u></p> <p>a. Accuracy: Accuracy: report ULTRAMAT 23 – Operating instruction.pdf stating +/- 2% (maximum error) for CH₄ and 0.05% for O₂</p> <p>b. Calibration frequency: ULTRAMAT23 Manual # C79000 – G5279-C216-05, pg 32 stating calibration frequency equal to 1 year</p> | | |
| 21. | <p>3C Lab</p> <p>FCI Souza Engenharia</p> <p>ISOCELL ACELCO</p> <p>FCI</p> | <p><u>Calibration Certificates (for the calibration dates and validity, refer to Section E.7 above):</u></p> <p>1. <u>Electricity meter</u></p> <p>a. Calibration certificates provided by 3C Lab</p> <p>2. <u>Flow meter:</u></p> <p>a. Calibration certificates provided by FCI and Souza Engenharia</p> <p>3. <u>Gas analyser (residual gas)</u></p> <p>a. Calibration certificates provided by ISOCELL and ACELCO</p> <p>4. <u>Thermocouple (residual gas)</u></p> | | PP |

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|-----|-----------|--|---|-------|
| | Honeywell | a. Calibration certificates provided by FCI and Souza Engenharia | | |
| | ECIL | 5. <u>Pressure meter</u> a. Calibration certificates provided by Honeywell | | |
| | ASELCO | 6. <u>Thermocouple (exhaust gas)</u> a. Calibration certificates provided by ECIL 7. <u>Gas Analyser (exhaust gas)</u> a. Calibration certificates provided by ISOCELL and ACELCO. Maximum error found for O2 analysis was equal to 0.2%. | | |
| 22. | CCEE | <u>INFOMERCADO reports – Official source of electric data used for cross-check electricity measurements</u> - Select “SELECIONE O BOLETIM” - Select “Infomercado Mensal” - Select year - Download “Infomercado Dados Individuais YYYY” | https://www.ccee.org.br/portal/faces/pages_publico/o-que-fazemos/infomercado?_afLoop=198254581209649&_adf.ctrl-state=eq8sm8sup_107#!%40%40%3F_afLoop%3D198254581209649%26_adf.ctrl-state%3Deq8sm8sup_111 Accessed on 08/04/2021 | Other |
| 23. | PP | <u>Information regarding current operation of Landfill</u> 1. Declaration from PP regarding the operation of Landfill, stating that there is no change in the operation of Landfill when comparing to the design described in the PDD (Ofício 10 2021(Auditoria Biogás)). 2. Manufacturer’s Specifications Flare: Technical Specification of the Flare Model BTG2500HT # BTG 163/13 3. Technical description of Electricity generation units: Technical description Genset Container JGC 420 GS-L.L | - 01/04/2021 04/01/2013 22/05/2012 | Other |
| 24. | PP | <u>Maintenance log:</u> | | PP |

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|-----|-------------------|---|--|-------|
| | | <ol style="list-style-type: none"> 1. Daily maintenance book with all events from generators (Controle Parada v9.1_JAB_YYYY) 2. Daily maintenance book with all events from flares (Paradas Flares – JAB_YYYY) 3. <u>Equipment exchange</u> <ol style="list-style-type: none"> a. FT03_Historico de Eventos_2021.03.22 b. FT04 - Histórico de Eventos c. PT05_Histórico de Eventos_2021.03.30 d. TT07_Histórico de Eventos_2021.03.30 e. TT09 - Histórico de Eventos_rev2021.01.29 | | |
| 25. | CPRH SEMAG | <u>Operational License:</u> <ol style="list-style-type: none"> 1. Landfill Operation License # 05.20.09.002555-9 –issued by CPRG (Environmental Agency of the State of Pernambuco) on 10/09/2020 2. LFG Collection, flaring and electricity generation Operation License # 048/2018 –issued by SEMAG (Environmental Agency of the Municipality of Jaboatão dos Guararapes) on 05/04/2019 | valid until 10/09/2023 valid until 06/04/2021 | PP |
| 26. | - | DNA of Brazil | http://www.mct.gov.br | Other |
| 27. | - | Brazilian Institute for the Environment | http://www.ibama.gov.br/ | Other |
| 28. | - | Environmental Agency of the State of Pernambuco | http://www.cprh.pe.gov.br/ | Other |
| 29. | - | INMETRO | www.inmetro.gov.br | Other |
| 30. | - | IPCC publications | www.ipcc-nggip.iges.or.jp | Other |
| 31. | - | UNFCCC | http://cdm.unfccc.int | Other |

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

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

| | | | | |
|--|----|--------------------|-----|-------------------------|
| FAR ID | xx | Section no. | E.2 | Date: DD/MM/YYYY |
| Description of FAR | | | | |
| <i>Not applicable</i> | | | | |
| Project participant response | | | | Date: DD/MM/YYYY |
| Documentation provided by project participant | | | | |
| | | | | |
| DOE assessment | | | | Date: DD/MM/YYYY |
| | | | | |

Table 2. CL from this verification

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|--|----|--------------------|-----|--------------------------|
| CL ID | 01 | Section no. | E.3 | Date : 05/03/2021 |
| Description of CL | | | | |
| <i>MR section A.1. It is not duly clarified in the MR why there is no measurement from 29/09/2018 until 26/07/2019. Moreover, it is not clear why the electricity generation has been accounted from 26/07/2019 if its commissioning approval was only on 30/07/2019.</i> | | | | |
| Project participant response | | | | Date : 02/04/2021 |
| A.1. <i>Explanation about non operation included.</i> <i>Amended to "The amount of CERs generated due to the electricity generation is requested only from 30/07/2019, date that corresponds to the date of commissioning of the first group generators."</i> | | | | |
| Documentation provided by project participant | | | | |
| <i>Monitoring Report version 3</i> | | | | |
| DOE assessment | | | | Date: 15/04/2021 |
| It is now clear in the MR that between 29/09/2018 and 26/07/2019 the plant was not operational due to the installation of group generators, which also affected the operation of flaring system. The flaring system restarted its operation on 26/07/2019 (checked in values provided in the raw data ^{/14/}) and from this date on, ERs are being claimed for methane destruction. From electricity generation, the commission of 1 st group generator was approved on 30/07/2019 ^{/16/} and therefore, only from this date on, the baseline emissions due to electricity generation is being claimed. The measures were duly explained in the MR and are considered accurate and conservative by verification team. | | | | |
| CL is closed | | | | |

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|--|----|--------------------|-------|--------------------------|
| CL ID | 02 | Section no. | E.4.2 | Date : 05/03/2021 |
| Description of CL | | | | |
| <i>MR, section B.2.2: corrections ref #s PRC-3958-001, PRC-3958-002 and PRC-3958-003 have not being mentioned in the MR unlike required by instructions for completing the MR.</i> | | | | |
| Project participant response | | | | Date : 02/04/2021 |
| <i>Section B.2.2 was revised on Monitoring Report version 2 and the previous corrections were mentioned.</i> | | | | |
| Documentation provided by project participant | | | | |
| <i>Monitoring Report version 3</i> | | | | |
| DOE assessment | | | | Date: 15/04/2021 |
| Information regarding previous corrections is now duly included in the MR as required by instructions for completing the MR. | | | | |
| CL is closed | | | | |

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|--------------------------|----|--------------------|-------|--------------------------|
| CL ID | 03 | Section no. | E.6.1 | Date : 05/03/2021 |
| Description of CL | | | | |

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|--|--------------------------|
| <i>MR, section D.1 not all applicable fixed parameters were included in the Section D.1 of the MR unlike required by instructions for completing the MR.</i> | |
| Project participant response | Date : 02/04/2021 |
| <i>Fixed parameters amended accordingly Ru parameter included according to TOOL08</i> | |
| Documentation provided by project participant | |
| <i>Monitoring Report version 3</i> | |
| DOE assessment | Date: 15/04/2021 |
| All applicable parameters to this monitoring period were duly included in the section D.1 of the MR as required by instructions for completing the MR. The ones that are not applicable in the calculations during this period were also duly mentioned in the same section. | |
| CL is closed. | |

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|--|----|--------------------|-------|--------------------------|
| CL ID | 04 | Section no. | E.6.2 | Date : 30/04/2021 |
| Description of CAR | | | | |
| <i>MR section D.2 – TDL: the monitoring plan of registered PDD sets an annual monitoring frequency. Nevertheless, the MP covers 3 different years and just the value of 2019 is being used.</i> | | | | |
| Project participant response | | | | Date : 04/05/2021 |
| <i>Amended under section D.2</i> | | | | |
| Documentation provided by project participant | | | | |
| <i>National Energy Balance 2020.^[24]</i> | | | | |
| DOE assessment | | | | Date: 06/05/2021 |
| Evidence that has been provided refer to the information from year 2019 (National Energetic Balance from 2020), which is the latest available data. As the project is only operational during 2019 and 2020 (the operation start date of the PA during this MP is from July 2019), the 2019 value for the parameter is being used for years 2019 and 2020 as the latest available data, in accordance with registered monitoring plan. | | | | |
| CL is closed | | | | |

| | | | | |
|--|----|--------------------|-------|--------------------------|
| CL ID | 05 | Section no. | E.8.5 | Date : 05/03/2021 |
| Description of CL | | | | |
| <i>MR section E.5 and front page: as required by instructions for completing the MR, the comparison between the estimated ERs and the achieved during the MP are to be made with adjustment from the comparable period as appropriate. Considering that the plant was not operating from 29/09/2018 until 26/07/2019, the comparison is not being carried out in accordance with requirements.</i> | | | | |
| Project participant response | | | | Date : 02/04/2021 |
| <i>Amended accordingly, considering monitoring days between 27/07/2019 until 02/03/2020.</i> | | | | |
| Documentation provided by project participant | | | | |
| <i>Monitoring Report version 3 Candeias_Consolidated 6a VER v4</i> | | | | |
| DOE assessment | | | | Date: 15/04/2021 |
| The estimated ERs are now being accounted only during the operational period of the project activity, i.e. from 26/07/2019 until 02/03/2020. Proportional values were duly calculated based on data provided in the current valid version of the PDD. The calculation is accurate and duly provided in the MR, front page, section E.5 and duly demonstrated in section E.5.1. | | | | |
| CL is closed | | | | |

Table 3. CAR from this verification

| | | | | |
|---|----|--------------------|-------|--------------------------|
| CAR ID | 01 | Section no. | E.6.2 | Date : 05/03/2021 |
| Description of CAR | | | | |
| <i>Calibration frequency of flowmeter S/N 662114 and S/N 678921 that measure the residual gas to engines (parameters $V_{t,db}$ and $V_{RG,m}$ and T_t) is not in accordance with evidences provided</i> | | | | |
| Project participant response | | | | Date : 02/04/2021 |
| <i>Information was amended in the revised version of the Monitoring Report.</i> | | | | |

| Documentation provided by project participant | |
|---|-------------------------|
| <i>Monitoring Report, version 3</i> | |
| DOE assessment | Date: 15/04/2021 |
| The calibration frequency of flowmeters S/N 662114 and S/N 678921 that measure the residual gas to engines (parameters $V_{t,db}$ and $V_{RG,m}$ and T_t) is was amended and is now in accordance with evidences provided which is equal to 18 months (1.5 years). Information is correctly included in the MR section D.2. No calibration delays have been observed for these meters. | |
| CAR is closed | |

| | | | | |
|---|----|--------------------|-------|--------------------------|
| CAR ID | 02 | Section no. | E.8.1 | Date : 05/03/2021 |
| Description of CAR | | | | |
| <i>The calculation of grid emission factor is not being carried out in accordance with PDD and TOOL07.</i> | | | | |
| Project participant response | | | | Date : 02/04/2021 |
| <i>The emission factor calculation was revised following the procedures of the mentioned Tool. The Monitoring Report and CERs calculation spreadsheet were vided accordingly.</i> | | | | |
| Documentation provided by project participant | | | | |
| <i>Emission Factor calculation spreadsheets.</i> | | | | |
| DOE assessment | | | | Date: 15/04/2021 |
| The emission factor has been calculated in accordance with requirements of TOOL07 for electricity generation and electricity consumption separately. They were accurately calculated based on information provided by Brazilian DNA on the hourly EF_{OM-DD} . The EF calculations spreadsheet is provided and considered correct by verification team. | | | | |
| CAR is closed | | | | |

| | | | | |
|--|----|--------------------|-------|--------------------------|
| CAR ID | 03 | Section no. | E.8.1 | Date : 09/03/2021 |
| Description of CAR | | | | |
| <i>ER calculations</i> | | | | |
| <ol style="list-style-type: none"> <i>The formula applied in the monthly ER calculations spreadsheet, tab 2020, column BY is not in accordance with TOOL06.</i> <i>it is being observed that there is flow in the flare 2 (for example From 31/07/2019 at 16:12 tab 2020 column BQ). Nevertheless, only one flare is installed during the monitoring period as informed to the verification team.</i> <i>As per monitoring plan, the LFG data is to be measured every minute. It is required to explain why this frequency is not being followed in several dates (e.g. monthly spreadsheet 09-2019 tab raw data adjusted line 8644 to 8646, among others)</i> <i>Raw data provided for 30/11/2019 and 01/12/2019 are not in accordance with data used in the ER calculations spreadsheet (monthly sheet).</i> <i>For the period which exhaust gas analyser has its calibration delayed, the correction factor for O₂, although applied, is not being used in the ER calculations (monthly sheet, tab 2020 column BW. – Ana/João</i> | | | | |
| Project participant response | | | | Date : 02/04/2021 |
| <ol style="list-style-type: none"> <i>Columns BY and BZ, formulae corrected in accordance with TOOL06</i> <i>Since Flare 2 was not installed, all data related to this flare was excluded from the CERs calculation</i> <i>Despite the description that LFG data is to be measured every minute, according to the history of Asja's (plant operator) operations, failures in data records may be related to several failures, such as; non-operation of the plant, interruptions for maintenance and replacement of equipment, occasional loss of communication between PLC / supervisory, update of the supervisory software, errors of the supervisory software, installation of Windows update, errors of Windows, etc.</i> <i>30/11/2019 and 01/12/2019 amended accordingly.</i> <i>The application error for delayed calibration have been amended and properly applied in CERs calculation spreadsheets</i> | | | | |
| Documentation provided by project participant | | | | |
| <i>Monthly calculation spreadsheets "YYYY MM Candeias CERs_ALLCOT v4"</i> | | | | |
| <i>Monitoring Report, version 3</i> | | | | |
| DOE assessment | | | | Date: 15/04/2021 |

1. Formula applied in Columns CA and CB (former BY and BZ respectively) were updated in accordance with formulae presented in applied version of TOOL06.
2. Only small measurements were recorded in the raw data referred to Flare 2. By checking the data, it was clear that they did not represent an operational flare but some residual figures which were duly excluded from ER calculations. No ERs are being claimed for combusting landfill gas in flare 2 as this flare does not exist, which was observed during OSV carried out during verification process. The information is now accurate and in accordance with project description. The calculations are considered correct by verification team.
3. It is clear to verification that, although measurement are to be carried out every minute, some inconsistencies and data loss are expected. These events occur mainly due to power loss, communication loss or other reasons. Nevertheless, conservative measures were taken when minutes are missing from measurements: the ERs associated to these minutes are equal to zero. This measure is very conservative as no ERs are being claimed during these events.
4. Raw data downloaded directly from system is now duly applied in the ER calculations. The application of raw values are now accurate.
5. The calibration delays were now duly taken into account in the ER calculations. Maximum error between the results from following calibration and maximum equipment error were applied in a conservative way. The calculation is now accurate.

CAR is closed

Table 4. FAR from this verification

| FAR ID | xx | Section No. | Date: DD/MM/YYYY |
|---|----|-------------|------------------|
| Description of FAR | | | |
| | | | |
| Project participant response | | | Date: DD/MM/YYYY |
| | | | |
| Documentation provided by project participant | | | |
| | | | |
| DOE assessment | | | Date: DD/MM/YYYY |
| | | | |

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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 | | |