Monitoring report form for CDM project activity
(Version 06.0)

MONITORING REPORT		
Title of the project activity	Salvador da Bahia Landfill Gas Management Project	
UNFCCC reference number of the project activity	0052	
Version number of the PDD applicable to this monitoring report	14.1	
Version number of this monitoring report	1.0	
Completion date of this monitoring report	09/04/2019	
Monitoring period number	#5	
Duration of this monitoring period	01/01/2011 to 31/12/2012	
Monitoring report number for this monitoring report	Not applicable.	
Project participants	BATTRE Bahia Transferencia e Tratamento de Resíduos S.A. Showa Shell Sekiyu K.K. Shell Trading International Limited Electrabel S.A	
Host Party	Brazil	
Sectoral scopes	13 – Waste handling and disposal	
Applied methodologies and standardized baselines	ACM0001 – "Flaring or use of landfill gas" (version 15.0)	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	678,298 tCO_2	-
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	833,251 tCO2e	

SECTION A. Description of project activity

A.1. General description of project activity

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The registered CDM project activity "Salvador da Bahia Landfill Gas Management Project" promotes methane destruction through collection and combustion of landfill gas (LFG) at the Aterro Metropolitano Centro (AMC) landfill.

As per its current project design configuration (as also valid during the entire considered monitoring period from 01/01/2011 to 31/12/2012 and as described in the latest registered version of the PDD valid for its 2nd 7-year crediting period (hereafter termed "PDD")), combustion of collected LFG (rich in methane (CH_4)) as part of the project activity has occurred in the following methane destruction devices:

- Set of 2 high temperature enclosed flares[1]
- Set of 19 identical internal combustion gas engines (which represents, at the same time, (i) additional/alternative methane destruction devices for the project activity and (ii) the major components for a grid-connected electricity generation infrastructure fuelled by LFG under operation within the geographical limits of the AMC landfill since January/2011)[2].

The project activity has been under regular operation since 12 March 2004 and LFG has been historically generated at AMC landfill due to anaerobic decomposition of Municipal Solid Waste (MSW) disposed in the site.

The project activity has been operated by the host-country project participant and project owner Bahia Transferência e Tratamento de Resíduos Ltda. (BATTRE) since its implementation and commissioning. BATTRE is a special purpose waste management company that was established to undertake services of collection, transport and disposal of all MSW generated in the city of

[1] The operation of one of the 3 gradually previously installed high temperature enclosed flares (Flare 3) was temporarily interrupted for maintenance and overhauling purposes in March/2012. In order to proceed with required overhauling work, Flare 3 (incl. related monitoring instruments and ancillary components) was completely disassembled, removed from the project site and sent to a workshop. Among required service, complete replacement of the flare's ceramic revetment material, welding work and complete painting in the flare external surface was diagnosticated as required. Due to cost and budgeting related issues, the required flare complete overhauling work was not completed and Flare 3 thus remains disassembled. Since in January/2011, the largest share of LFG collected as part of the operation of the project activity has been sent to combustion in the set of 19 identical internal combustion gas engines. Due to that, only a small fraction of collected LFG has actually been sent to the set of installed high temperature enclosed flares for combustion. Thus, by taking into account the nameplate flaring capacity of the previously installed 3 flares (Flare 1, Flare 2 and Flare 3), the typical stream of collected LFG that has been sent to the set of flares has not been under a flow high enough to require Flare 3 to be again under continuous operation (even during temporary interruptions of operation of the set of 19 internal combustion gas engines). In April/2019 (more than 6 years after the occurred removal of Flare 3 from the project site), there it is still unclear when required complete overhauling work in Flare 3 will be concluded. If applicable, upon the yet to occur confirmation that Flare 3 will not be reinstalled in the project site, the permanent decision of having the project activity permanently encompassing 2 high temperature enclosed flares (Flare 1 and Flare 2) will be addressed as per applicable CDM rules for permanent post-registration changes in the project design.

[2] As detailed in the PDD, methane destruction through combustion of LFG (rich in methane) also occurring in a set of 19 identical internal combustion gas engines (since January/2011) represents more recently approved post-registration permanent change in the design of the project activity. This set of internal combustion gas engines are the basis of 19 state-of-the-art engine-generators set model/series JMS 320 GS manufactured by GE Jenbacher GmbH & Co OHG (with nameplate power generation capacity of 1.06 MW each). With destruction of methane also occurring through combustion of collected LFG in such set of internal combustion gas engines (which are regarded as additional/alternative methane destruction devices for the project activity), the project activity remains encompassing methane destruction as its unique GHG abatement/mitigation measure.

It is relevant to note that, under conformance with the PDD, no emission reductions associated to generation of electricity by such grid-connected electricity generation infrastructure (entirely fuelled by LFG) is accounted and/or claimed as part of the project activity.

Salvador, Bahia in Brazil. All BATTRE's operations related to management of MSW (including the construction and operation of the AMC landfill) have been performed as per the directives/requirements of a previously established public service concession contract for MSW management that was previously established between BATTRE and the Administration of the Municipality of Salvador in year 1999 the context of a public tendering process.

By the end of the considered monitoring period, the implemented project's LFG collection system encompassed about 319 operational vertical LFG collection wells. No horizontal LFG collection trenches have so far been utilized for collecting LFG at the AMC landfill. During the considered monitoring period, LFG was collected at the AMC landfill with the utilization of 3 centrifugal blowers which are connected to the project's LFG collecting pipeline network.

Consumption of electricity by the project activity (electricity regarded as sourced by the grid and electricity sourced by installed backup captive off-grid electricity generator (fuelled by diesel)):
During the considered monitoring period, the electricity demand of the project activity has been entirely met by electricity generated by the project activity (whenever the project's electricity generation infrastructure is under operation). During time periods when the project's electricity generation infrastructure is not under operation (temporary interruptions), electricity demand of the project activity has been met by imports of grid electricity through the same dedicated transmission line which is used for exporting electricity generated by the project activity.

A backup off-grid captive diesel electricity generator (fueled by diesel) is also used as an electricity supply source to the project activity whenever there are temporary interruptions on the supply of grid-sourced electricity to the project activity

Consumption of Liquefied Petroleum Gas (LPG) by project activity:
Under conformance with the project design description as outlined in the PDD, consumption of very low amount of fossil-fuel Liquefied Petroleum Gas (LPG) is expected to be consumed as part of the operation of the project activity. As per the project design, LPG has been used as an alternative start-up fuel to ignite the high temperature enclosed flares whenever their operation needs to the reestablished (e.g. after maintenance/repair events). While collected LFG has also been used as alternative start-up fuel to ignite the high temperature enclosed flares, no consumption of LPG thus occurred during the considered monitoring period.

A.2. Location of project activity

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The project activity is implemented at the AMC landfill. This landfill is located in a suburban rural region of the city of Salvador (about 20 km towards North-East direction from the city's central region). The AMC landfill is located within the limits of the city of Lauro de Freitas, which is a satellite city to the city of Salvador in Bahia State, Brazil.

Address of the AMC landfill:
Cia. Aeroporto, Road, km 6.5
Geographical location: 12°51'45"S (-12.8625) and 38°21'59"W (-38.3636)

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host country)	Bahia Transferência e Tratamento de Resíduos S.A.	No.
Japan	Showa Shell Sekiyu K.K.	No.
United Kingdom of Great Britain and Northern Ireland	Shell Trading International Limited	No.

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Netherlands	Electrabel S.A.	No.

A.4. Reference to applied methodologies and standardized baselines

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The project activity applies the following large-scale CDM baseline and monitoring methodology:

- ACM0001 – "Flaring or use of landfill gas" (version 15.0). (https://cdm.unfccc.int/methodologies/DB/Y88077XT5O83TZ2PYEZ36LFIAMAODR)

For the considered monitoring period, as also established in the PDD, the following methodological tools are also applied:

- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) (http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf).
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) (http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf)
- "Project emissions from flaring" (version 02.0.0, EB 68) (http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v2.0.pdf);
- "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0, EB 61) (http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v2.0.0.pdf);
- "Tool to calculate the emission factor for an electricity system" (version 04.0) (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf)

A.5. Crediting period type and duration

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From 01/01/2011 to 31/12/2017 (2nd 7-year renewable crediting period).

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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As per the project design, the project's LFG collecting wells are used to extract LFG from inner section of the landfill. At the ending date of the considered monitoring period, the project's LFG collection system consisted of about 319 operational LFG collecting wells (all interconnected through a high-density polyethylene (HDPE) pipeline network). Through such pipeline network, all collected LFG passes through condensation pots where most of the moisture in collected LFG is removed through condensation prior of being sent to the project's methane destruction devices (i.e. set of high temperature enclosed flares and set of internal combustion gas engines) for controlled combustion. Stream of LFG sent to the set internal combustion gas engines passes through additional centrifugal blowers and through a LFG cooling/treatment unit where LFG is cooled in order to meet fuel requirements for such engines.

The quantity and quality of collected LFG sent to each one of the high temperature enclosed flares and to each internal combustion gas engine set are measured, recorded and reported as per applicable monitoring guidance of ACM0001 (version 15.0) and the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) (with Option C being applied). Thus, the determination of the absolute humidity of the gaseous stream is not required. Fraction of CH_4 as well as flow of collected LFG stream sent to the project's methane destruction devices are continuously measured on the same moisture basis.

During the considered monitoring period encompassing the period from 01/01/2011 to 31/12/2012, the project activity encompassed the operation of the following equipment:

- 1 condensation trap to separate liquids in the collected LFG (leachate and condensate);
- 3 centrifugal blowers of 4-stage type, manufactured by Houston Service Industries – his and powered by electric motor (with nameplate power of 200 HP).
- Set of 3 high temperature enclosed flares manufactured by BTS - Termodinâmica de Sistemas Ltda. The flares are equipped with a pilot flame fuelled by LPG.
- One off-grid captive backup electricity generator (fuelled by diesel) with 700 kVA (560 kW for a power factor of 0.8) of nameplate power generation capacity. As per the project design, this backup off-grid electricity generator is used for emergency purposes only (during temporary situations when the supply of electricity regarded as sourced by the grid is interrupted to the project activity). The installed backup captive off-grid power generation unit is manufactured by STEMAC S/A Grupos Geradores (Brazil) and is of model G – GMC / 440 V voltage / 60 Hz.
- Set of 19 identical internal combustion gas engines in which collected LFG is combusted. This set of internal combustion gas engines are the basis of 19 state-of-the-art engine-generators set model/series JMS 320 GS manufactured by GE Jenbacher GmbH & Co OHG (with nameplate power generation capacity of 1.06 MW each).
- Collected LFG passes through a LFG cooling/treatment unit (electrical LFG chilling and activated-carbon LFG purification/filtering equipment).

Details about monitoring instruments/equipment under operation during the considered monitoring period are included in Section C.

The project activity was implemented and has operated under full conformance with its design configuration (as described in the PDD) during the whole considered monitoring period.

During the considered monitoring period, the project activity faced events when it became temporarily out of operation due to different reasons (occurred temporarily interruption of supply of collected LFG to the set of 19 internal combustion gas engines, temporarily interruption in the supply of electricity to the project activity, occurrence of previously planned or unplanned equipment maintenance/repair events, performance regular calibration events, draining of excess of condensate material from the project's LFG pipeline, identification of unexpected problems in the PLC panel, data communication problems, etc.).

Furthermore, it is also crucial to note that due to lack of operational LFG collection infrastructure covering all the whole area of the AMC landfill, the project activity operated under limited activity level during the whole considered monitoring period (when compared to the quantitative estimates of the project's potential for promoting LFG collection and GHG emission reductions as outlined in the PDD). Due to that, collected LFG was not combusted in all of the methane destruction devices currently encompassed by the project activity (3 high temperature enclosed flares + 19 internal combustion gas engines).

The AMC landfill is regarded as a very well-designed and well-managed landfill. It currently applies the best practice available in Brazil in terms of MSW landfilling from both design and operation perspectives. As established by the valid environmental and operational permits, all disposed MSW is covered and levelled with the use of heavy equipment (excavators, compacting equipment, etc.). Furthermore, safety requirements are defined and addressed as part of the operation of the AMC landfill by using a preventative approach. No practice to deliberately increase the amount of methane generated at the AMC landfill has ever been applied. While the implementation and operation of the project activity represents real improvement in terms of LFG management at the landfill (when compared to the situation prior to the implementation of the project activity (baseline scenario)), no change in terms of MSW disposal practice at the AMC landfill was ever promoted or influenced by the project activity. Further details are included in Section D.2 (under details for the monitoring parameter "Management of SWDS").

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

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Not applicable for the considered and/or previous monitoring periods. There are no temporary deviations from the registered monitoring plan and/or applied CDM baseline and monitoring methodology and/or applicable methodological tools encompassed by the considered monitoring period and/or previously approved by the CDM-EB.

In fact, no temporary deviations from the registered monitoring plan and/or applied CDM baseline and monitoring methodology and/or applicable methodological tools were ever addressed in the context of previously performed and approved post-registration changes for the project activity (PRC-0052-001, PRC-0052-002 and PRC-0052-005).

B.2.2. Corrections

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There are no corrections (in information that do not affect the project design) encompassed specifically by the considered monitoring period.

It is however relevant to note that corrections (in information that do not affect the project design) were previously approved (under PRC-0052-001 and PRC-0052-002) as changes applicable/valid for monitoring period(s) prior to the considered monitoring period (thus not in the particular context of the verification assessment for the considered monitoring period) as follows:

Ref. of PRC processes so far encompassed by the project activity	Approval date	Description of the post-registration change(s) under the category "Corrections"
PRC-0052-001	18/07/2014 (Prior approval track)	Corrections (in information that do not affect the project design): (i) Correction of the value for ex-ante determined parameter "Conversion Factor" (CF). This parameter represents density for the greenhouse gas methane (CH4). (ii) Revision of ex-ante estimations of emission reductions to be achieved by the project activity during the 1st 7-year renewable crediting period. This revision is due to the following aspects: - Application of more accurate values for organic content and amount of Municipal Solid Waste (MSW) historically disposed at the AMC landfill; - Use of more appropriate approach for estimating the amount of methane to be generated at the AMC landfill and to be collected by the project activity. Such estimations are performed by applying a more recent and appropriated approach (as per the latest version of the methodological tool "Emission from solid waste disposal sites"). - Consideration of leakage emissions due to the consumption of both grid-sourced electricity and LPG by the project activity and - Consideration of the correct value for the ex-ante determined parameter CF (density of methane). (iii) Inclusion of descriptions of details of applicable monitoring procedures which are in place since the

		start of operations of the project activity (in Section B.6.3 – Other elements of monitoring plan) (iv) Major general corrections/improvements in PDD texts and tables (that do not affect the project design) in order to improve the comprehension of the following project related aspects: - Description of the project activity and applied technology (including more precise project location details, pictures, schematic figures, etc.) - Description of applied methodological choices (incl. GHG calculations), - Description of the previously identified baseline scenario + demonstration of additionality, - Description of the previously assessed environmental aspects/impacts - Use of the latest version of the CDM-PDD form (version 04.1) and its completion by applying the latest version of the "Guidelines for completing the Project Design Document form" (version 01.0)75 - Clarification (added in Appendix 3) about the occurred permanent post registration changes in the project design which is valid in the context of the yet to be renewed 2nd 7-year crediting period (from 01/01/2011 to 31/12/2017)76 - Clarification (added in Appendix 6) of the rationale for the relative delay (about 8 years!) on addressing the post-registration in a revised version of the PDD. -
PRC-0052-002	29/05/2015 (Issuance track)	Corrections (in information that do not affect the project design): (i) Inclusion of missing table with monitoring details for the monitoring parameter "Amount of grid electricity consumed by the project activity during the year y" (ECgrid,y) in Section B.7.1. (It is important to note that, as outlined below in the summary of post-registration changes valid for version 6 of the PDD (dated 27/12/2013), the inclusion of ECgrid,y as an additional monitoring parameter in the monitoring plan for the project activity was already performed as part of such previous revision of the PDD). (ii) (ii) Removal of a duplicate table with monitoring details for the monitoring parameter "Quantity of LPG consumed by the project activity" (FCLPG,y) from Section B.7.1. (iii)

It is also relevant to note that additional corrections (in information that do not affect the project design) were more recently approved (under PRC-0052-005) as changes applicable/valid for monitoring periods from 01/01/2011 onwards (including the considered monitoring period) as independent validation opinion assessment (thus not in not in the particular context of the verification assessment for the considered monitoring period) as follows:

Ref. of PRC processes so far encompassed by the project activity	Approval date	Description of the post-registration change(s) under the category "Corrections"
PRC-0052-005	06/12/2018 (Prior	Corrections (in information that do not affect the project

	approval track)	design): - General text and terminology revision of project description in order to fully comply with the currently applicable requirements for completing the CDM-PDD form (version 10.1) (as established by its attachment "Instructions for completing this form") and to enhance/improve the project design description. - Minor text improvements (incl. review of statements and correction of previously existent typographic mistakes) in order to improve the overall project description. CDM-PDD-FORM Version 10.1 Page 221 of 222 - Revision of ex-ante estimates of emission reductions to be achieved by the project activity during its 2nd 7-year crediting period (by inter alia jointly taking into account (i) the use of more update and recently available data for estimating applicable values for CO2 emission factor for the electricity grid (from which grid-sourced electricity is imported) and (ii) the determination of project emissions due to consumption of electricity by the project activity through direct application of Scenario C of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01)).

B.2.3. Changes to the start date of the crediting period

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Not applicable for the considered and/or previous monitoring periods. There are no changes to start date of the crediting period encompassed by the considered monitoring period and/or previously approved by the CDM-EB. In fact, no change to start date of the crediting period was ever addressed in the context of any one of the previously performed and approved post-registration changes for the project activity (PRC-0052-001, PRC-0052-002 and PRC-0171-005[3]).

B.2.4. Inclusion of monitoring plan

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Not applicable for the considered and/or previous monitoring periods. There is no inclusion of monitoring plan (and/or applicable methodological tools) encompassed by the considered monitoring period and/or previously approved by the CDM-EB as being applicable for the considered monitoring period. In fact, no inclusion of monitoring plan was ever addressed in the context of previously performed and approved post-registration changes for the project activity (PRC-0052-001, PRC-0052-002 and PRC-0171-005).

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

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[3] The previously performed assessments and request of approval of post-registration changes for the project activity under ref. PRC-0052-003 and PRC-0052-004 were rejected by the CDB-EB.

There are no permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied CDM baseline and monitoring methodology and/or applicable methodological tools encompassed specifically by the considered monitoring period.

It is however relevant to note that permanent changes to the registered monitoring plan were previously approved (under PRC-0052-001) as changes applicable/valid for monitoring period(s) prior to the considered monitoring period (thus not in the particular context of the verification assessment for the considered monitoring period) as follows:

Ref. of PRC processes so far encompassed by the project activity	Approval date	Description of the post-registration change(s) under the category "Permanent changes to the registered monitoring plan, or permanent deviation of monitoring form the applied methodologies, standardized baselines, or other applied standards or tools"
PRC-0052-001	18/07/2014 (Prior approval track)	Permanent changes from the registered monitoring plan: (i) More appropriate approach for monitoring parameters required for determining leakage emissions due to the consumption of grid-sourced electricity by the project activity (as per the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption") (with related calculation approach also being included in the PDD in Section B.6.1 - Explanation of methodological choices); (ii) Appropriate approach for monitoring parameters required for determining leakage emissions due to the consumption of fossil fuel LPG by the project activity (as per the latest version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion"72) (with related calculation approach also being included in the PDD in Section B.6.1 - Explanation of methodological choices); (iii) Appropriate approach for determining project emissions from residual methane emissions due to flaring of LFG by the project activity (based on monitoring the CH4 combustion efficiency in the project's high temperature enclosed flares) (with related calculation approach also being included in the PDD in Section B.6.1 - Explanation of methodological choices); (iv) More appropriate approach for determining the annual amount of methane that would be destroyed in the baseline scenario (absence of the project activity) (with related calculation approach also being included in the PDD in Section B.6.1 - Explanation of methodological choices). This needed change is based on applicable contractual requirements and data/information made available by the Administration of the Municipality of Salvador (municipal authority). By applying such revised monitoring approach, it is assumed that the quantitative value for the parameter $CH4_{baseline,y}$ is equal to the value for the monitoring parameter $CH4_{contract,y}$ for each year of the crediting period.

It is also relevant to note that permanent changes in the monitoring plan were more recently approved (under PRC-0052-005) as changes applicable/valid for monitoring periods from 01/01/2011 onwards (including the considered monitoring period) as independent validation opinion assessment (thus not in not in the particular context of the verification assessment for the considered monitoring period) as follows:

Ref. of PRC processes so far encompassed by the project activity	Approval date	Description of the post-registration change(s) under the category "Permanent changes to the registered monitoring plan, or permanent deviation of monitoring form the applied methodologies, standardized baselines, or other applied standards or tools"
PRC-0052-005	06/12/2018 (Prior approval track)	Permanent changes from the registered monitoring plan: - Revision of the applied monitoring and GHG calculation approaches by including additional monitoring requirements and calculation approaches for determining the following GHG emissions as a result of the occurred changes in the project design: (i) Baseline emissions for methane (due to destruction of LFG (rich in methane) also occurring in the set of 19 identical internal combustion gas engines (which are regarded as additional/alternative methane destruction devices for the project activity) (ii) Project emissions (due to the consumption of electricity sourced by the installed backup captive off-grid electricity generator (fuelled by diesel)). Project emissions due to consumption of electricity (sourced by the grid and/or installed backup electricity generator (fuelled by diesel)) will determined by applying guidance of Scenario C of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01). As a result of the related revision of the applied GHG calculation and monitoring approaches, additional ex-ante determined parameters and parameters monitored ex-post are added (i.e. $Op_{j,h}$, $EF_{EL,captive,y}$, $EF_{EL,grid,y}$, $EC_{PJ,captive,y}$, $FC_{Diesel,y}$, $NCV_{Diesel,y}$, $EF_{CO2,Diesel,y}$, $EG_{Diesel\text{-}Generator,y}$, $TDL_{captive,y}$) and parameter $TDL_{grid,y}$ will be monitored ex-post.

B.2.6. Changes to project design

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There are no changes to the project design encompassed specifically by the considered monitoring period.

It is however relevant to note that changes to the project design were previously approved under PRC-0052-001 as changes applicable/valid for monitoring period(s) prior to the considered monitoring period (thus not the particular context of the verification assessment for the considered monitoring period) as follows:

Ref. of PRC processes so far encompassed by the project activity	Approval date	Description of the post-registration change(s) under the category "Changes to project design"

PRC-0052-001	18/07/2014 (Prior approval track)	Permanent changes in the design of the project activity: (i) Consumption of Liquefied Petroleum Gas (LPG) by the project activity for igniting the installed high temperature enclosed flares (after temporary planned or unplanned interruptions of operation of the flares).

It is also relevant to note that additional permanent changes to the project design were more recently approved (under PRC-0052-005) as changes applicable/valid for monitoring periods from 01/01/2011 onwards (including the considered monitoring period) as independent validation opinion assessment (thus not in not in the particular context of the verification assessment for the considered monitoring period) as follows:

Ref. of PRC processes so far encompassed by the project activity	Approval date	Description of the post-registration change(s) under the category "Changes to project design"
PRC-0052-005	06/12/2018 (Prior approval track)	Permanent changes in the design of the project activity: - Inclusion of destruction of methane through combustion of LFG in a set of 19 identical internal combustion gas engines since 01/01/2011. While such set of identical gas engines are regarded as additional/alternative methane destruction devices for the project activity and represent major components for a grid-connected 20.1 MW electricity generation infrastructure located within the geographical limits of the AMC landfill; the project activity does not include electricity generation as an additional GHG abatement/mitigation measure for which related GHG emission reductions would be claimed. Thus, methane destruction remains being the only GHG abatement/mitigation measure of the project activity and CO2 emission associated to generation of electricity (using LFG as renewable energy source) in a grid-connected power generation infrastructure are not accountable/claimable as emission reductions part of the project activity. - Meeting of project's electricity demand through electricity generated by a backup captive off-grid electricity generator (fuelled by diesel) (with nameplate installed capacity of 700 kVA (560 kW for a power factor of 0.8)) is added as an option since January/2011.

SECTION C. Description of monitoring system

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DATA ACQUISITION, STORAGE AND MANAGEMENT SYSTEM

As part of the application of the monitoring plan valid for the 2nd 7-year crediting period of the project activity (under its current design configuration), monitoring data is automatically measured, processed and recorded with the use of related monitoring instruments/equipment, two

programmable logic controller (PLC) units [4] and a database (with design and configuration customized for the project activity under its current design configuration).

All of such infrastructure is integrated/linked to a data supervisory system of which design and configuration is also appropriately customized to the project activity (under its current design configuration). With exception of data related to consumption of electricity by the project activity, every-minute monitoring measures for the project activity are processed, recorded and archived by the use of such PLC units and database.

As part of the implemented data reporting and emission reduction calculation procedures, files with raw-data (primary data) are generated for each month of considered monitoring period. Files with raw-data contain monitoring records valid for every single minute of every month encompassed by the considered monitoring period. Monitoring data retrieved from the database is exported/reported in MS-Excel format and handled as a primary data input for the performance of emission reduction calculations. Through the application of a systematic working procedure, retrieved monitoring data is used as input data for the compilation of monthly emission reduction calculation spreadsheets + additional calculation spreadsheet with values of LFG flow to the project's methane devices which are all enclosed to this Monitoring Report.

The project's data supervisory system includes in its user interface functionalities for regular retrieval of monitoring data (generation of MS-Excel format files with raw-data). The figure below includes overview of the user interface of the project's supervisory system.

As per the project's operational procedure valid for the 2nd 7-year crediting period, the following routine (steps) is monthly performed by the project operational staff in order to appropriately report monitoring records and calculated achieved emission reductions:

1) Every month, a MS-Excel format spreadsheet data file with monitoring records (raw data files) is generated as part of regular retrieval of archived monitoring data for the project activity by using available functionality of the project's supervisory system. Each generated raw data file includes monitoring data reported for a full month.

2) The content of every-month raw data file (in MS-Excel format) (referred in item 1) are used as input data for the determination of baseline emissions due to combustion of LFG by the project activity in a customized and pre-formatted monthly MS-Excel format emission reduction calculation spreadsheet template/model (designed by the project participant BATTRE). This MS-Excel based template is internally denominated as *"MMYYYY"*, where *"MM"* is the number of the month and "*YYYY*" is the year of the input data.

As per applicable and currently valid documented working procedures, the project activity is managed by the CDM Project Superintendent at BATTRE. The CDM Project Superintendent supervises the CDM Project supervisor who is the one in charge monitoring related activities (handling of data, preparation of the Monitoring Report and emission reduction calculation spreadsheet). Both the CDM Project Superintendent and the CDM Project supervisor are fully supported by CDM specialists (consultants) from the CDM consultancy company UniCarbo Energia e Biogás Ltda.

The operation of the project activity and the application of the monitoring plan is responsibility of the CDM Project Supervisor, who reports all relevant project related issues to the CDM Project Superintendent (operation status of the project activity, results and events, collection and storage

[4] One PLC unit is used for processing signals from monitoring instruments/equipment of the project's LFG collection and flaring infrastructure. One additional PLC unit is used for processing signals from monitoring instruments/equipment related to combustion of collected LFG in the set of 19 internal combustion gas engines. Monitoring data processed by both of such PLC units are recorded in the project's database and can be visualized in the project's supervisory system.

of monitoring data, calibration events, and maintenance of equipment). The CDM specialists (consultants) also support the project team in operational and monitoring related issues.

The project's operational and management structure relies on trained staff with responsibilities clearly defined. All collaborators and employees involved with operation of project activity and/or its monitoring are trained internally and/or externally. Training efforts includes *inter alia*:

a) General competence development about generation, collection of LFG;
b) General competence development about combustion of collected LFG in both flares and internal combustion gas engines (methane destruction devices)
c) Review of equipment operational principles and captors;
d) Maintenance and calibration requirements for project's related equipment/instruments;
e) Procedures for data monitoring (incl. data gathering, data handling and data archiving);
f) Emergency and safety procedures.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	**OX_{top_layer}**
Unit	Dimensionless
Description	Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline
Source of data	Consistent with how oxidation is accounted for in the methodological tool "Emissions from solid waste disposal sites" (version 07.0)
Value(s) applied	0.1
Choice of data or measurement methods and procedures	Default value as per the applied CDM baseline and monitoring methodology ACM0001 "Flaring or use of landfill gas" (version 150.0)
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	**GWP_{CH4}**
Unit	tCO_2/tCH_4
Description	Global Warming Potential of CH_4

Source of data	The PDD refers to the "Global Warming Potential for Given Time Horizon" in table 2.14 of the errata to the contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, based on the effects of greenhouse gases over a 100-year time horizon. Information is available online: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14 The applied values are also in accordance with the "Standard for application of the global warming potential to clean development mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol"
Value(s) applied	21 (period from 01/01/2011 to 31/12/2012) 25 (period from 01/01/2013 onwards)
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	The applied value shall be updated according to any future COP/MOP decisions and/or decision by the CDM-EB.

Data/Parameter	**R_u**
Unit	$Pa.m^3/kmol.K$
Description	Universal ideal gases constant
Source of data	The PDD refers to the default value as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0).
Value(s) applied	8,314
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	**MM_i**
Unit	Kg/kmol
Description	Molecular mass of greenhouse gas *i*
Source of data	The PDD refers to the default value as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0).

Value(s) applied	As outlined in the registered PDD, the following value of molecular mass is applicable for CH_4 (the only GHG which is considered): Compound | Structure | Molecular mass (kg/kmol) Methane | CH_4 | 16.04
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	**MM_k**
Unit	Kg/kmol
Description	Molecular mass of gas *k*
Source of data	The PDD refers to the default value as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0).
Value(s) applied	As outlined in the PDD, for considered gases *k* that are greenhouse gases (GHGs), the values in the table below are applied for MMi. The following is defined by the applied methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0): *"The determination of the molecular mass of the gaseous stream ($MM_{t,db}$) requires measuring the volumetric fraction of all gases (k) in the considered gaseous stream. However as a simplification, only the volumetric fraction of gases k that are greenhouse gases and are considered in the emission reduction calculation in the underlying methodology must be monitored and the difference to 100% may be considered as pure nitrogen. The simplification is not acceptable if it is differently specified in the underlying methodology*." ACM0001 (version 15.0) does not include any restriction to such simplification. Thus, only the volumetric fraction of gases that are greenhouse gases and are considered in related calculations (CH_4 in the particular case of the project activity) should be considered and the difference to 100% is just considered as pure nitrogen. Compound | Structure | Molecular mass (kg/kmol) Nitrogen | N_2 | 28.01
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	MM_{H2O}
Unit	Kg/kmol
Description	Molecular mass of water
Source of data	The PDD refers to the default value as per the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 02.0.0).
Value(s) applied	18.0152
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	P_n
Unit	Pa
Description	Total pressure at normal conditions
Source of data	The PDD refers to the default values as per the methodological tool “Tool to determine the mass flow of greenhouse gas in a gaseous stream” (version 02.0.0).
Value(s) applied	101,325
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	T_n
Unit	K
Description	Temperature at normal conditions
Source of data	The PDD refers to the default value as per the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 02.0.0).
Value(s) applied	273.15

Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	**w_{BM}**
Unit	%
Description	Weighting of build margin emissions factor
Source of data	Applicable default value as per the methodological tool "Tool to calculate the emission factor for an electricity system" (version 04.0)
Value(s) applied	0.75 (75%)
Choice of data or measurement methods and procedures	The applicable value valid for 2nd crediting period as per the methodological tool "Tool to calculate the emission factor for an electricity system" (Version 04.0) is selected.
Purpose of data/parameter	Calculation of project emissions.
Additional comments	It is relevant to note that, as further explained in Section E.2, for the determination of the CO_2 emission factor for electricity consumed by the project activity, the PDD defines the following generic approach of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" regarding its determination by taking into account the potential sources for consumed electricity: *"Where case C.III has been identified, as a conservative simple approach, the emission factor for electricity generation should be the more conservative value between the emission factor determined as per guidance for scenario A and B respectively. This means that the more conservative value should be chosen between a) the result of applying either option A1 or A2 and b) the result of applying either option B1 or B2."* As further explained in Section E.2, the above-quoted options of the methodological tool (options A1, A2, B1 and B2) are thus all potentially applicable for the determination of $EF_{EL,grid,y}$ = $EF_{EL,captive,y}$ (with the determined value representing the most conservative (higher) value). In this context, the ex-ante determined value for w_{BM} is thus applied for the determination of $EF_{EL,grid,y}$ as per Option A1.

Data/Parameter	**w_{OM}**
Unit	%
Description	Weighting of operating margin emissions factor

Source of data	Applicable default value as per the methodological tool "Tool to calculate the emission factor for an electricity system" (version 04.0)
Value(s) applied	0.25 (25%)
Choice of data or measurement methods and procedures	The applicable value for the 2nd crediting period as per the methodological tool "Tool to calculate the emission factor for an electricity system" (version 04.0) is selected.
Purpose of data/parameter	Calculation of project emissions
Additional comments	It is relevant to note that, as further explained in Section E.2, for the determination of the CO_2 emission factor for electricity consumed by the project activity, the PDD defines the following generic approach of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) regarding its determination by taking into account the sources for consumed electricity: *"Where case C.III has been identified, as a conservative simple approach, the emission factor for electricity generation should be the more conservative value between the emission factor determined as per guidance for scenario A and B respectively. This means that the more conservative value should be chosen between a) the result of applying either option A1 or A2 and b) the result of applying either option B1 or B2."* As further explained in Section E.2, the above-quoted options of the methodological tool (options A1, A2, B1 and B2) are thus all potentially applicable for the determination of $EF_{EL,grid,y}$ = $EF_{EL,captive,y}$ (with the determined value representing the most conservative (higher) value). In this context, the ex-ante determined value for w_{OM} is thus applied for the determination of $EF_{EL,grid,y}$ as per Option A1.

Data/Parameter	**$EF_{grid,BM,y}$**
Unit	tCO_2/MWh
Description	Build margin CO_2 emission factor in year *y*
Source of data	Data is ex-ante determined as per applicable guidance of the methodological tool "Tool to calculate the emission factor for an electricity system" (version 04.0) valid for 2nd crediting period. The selected value valid for all years encompassed by the 2nd 7-year crediting period is the value calculated by the DNA of Brazil and valid for year 2014 ($EF_{grid,BM,2012}$). Data is made available online: https://www.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/emissao_despacho.html
Value(s) applied	0.2963
Choice of data or measurement methods and procedures	Data is determined as per applicable guidance of the methodological tool "Tool to calculate the emission factor for an electricity system" valid for 2nd crediting period.

Purpose of data/parameter	Calculation of project emissions
Additional comments	It is relevant to note that, as further explained in Section E.2, for the determination of the CO_2 emission factor for electricity consumed by the project activity, the PDD defines the following generic approach of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) regarding its determination by taking into account the sources for consumed electricity: *"Where case C.III has been identified, as a conservative simple approach, the emission factor for electricity generation should be the more conservative value between the emission factor determined as per guidance for scenario A and B respectively. This means that the more conservative value should be chosen between a) the result of applying either option A1 or A2 and b) the result of applying either option B1 or B2."* As further explained in Section E.2, the above-quoted options of the methodological tool (options A1, A2, B1 and B2) are thus all potentially applicable for the determination of $EF_{EL,grid,y}$ = $EF_{EL,captive,y}$ (with the determined value representing the most conservative (higher) value). In this context, the ex-ante determined value for $EF_{grid,BM,y}$ is thus applied for the determination of $EF_{EL,grid,y}$ as per Option A1.

<table>
<tr><td>Data/Parameter</td><td>$SPEC_{flare}$</td></tr>
<tr><td>Data unit</td><td>°C (for temperature values)
Nm^3/h (for LFG flow values)
Number of days (for maintenance schedule interval values)</td></tr>
<tr><td>Description</td><td>Manufacturer’s flare specifications for temperature, flow rate and maintenance schedule interval.</td></tr>
<tr><td>Source of data</td><td>Flare manufacturer</td></tr>
<tr><td>Value(s) applied</td><td>Flare 1, Flare 2 and Flare 3:
<table>
<tr><th>$SPEC_{flare,flare\ 1}$
$SPEC_{flare,flare\ 2}$
$SPEC_{flare,flare\ 3}$</th><th>Min.</th><th>Max.</th></tr>
<tr><td>Operational LFG flow (for continuous operation):</td><td>500 Nm^3/h</td><td>5,360 Nm^3/h</td></tr>
<tr><td>Required temperature of the exhaust gas of the flare (to ensure LFG destruction (combustion) under high CH_4 destruction efficiency):</td><td>500 °C</td><td>1,200 °C</td></tr>
<tr><td>Required minimum frequency for inspection and maintenance service (incl. inspection in the conditions of the flare isolation ceramics revetment material):</td><td colspan="2">Min. every year</td></tr>
<tr><td>Required/recommended minimum frequency for replacement of the flare isolation ceramics revetment material:</td><td colspan="2">after 10 years of regular and appropriate operation</td></tr>
</table></td></tr>
<tr><td>Choice of data or measurement methods and procedures</td><td>As established by the methodological tool “Project emissions from flaring”, the flare specifications and operational + maintenance requirements (as set/recommended by the equipment manufacturer) are documented and considered for the ex-ante determination of applicable values for the parameter $SPEC_{flare}$.
Selected data is to be compared against monitored data related to the operation of the flares, including:
a) Minimum and maximum monitoring records for data regarding inlet LFG flow rate,
(b) Minimum and maximum monitoring records for data of temperature in the exhaust gas of each individual high temperature enclosed flare; and
(c) Duration in days of time periods between maintenance events for each individual high temperature enclosed flare.</td></tr>
<tr><td>Purpose of data</td><td>Data is used for the determination of baseline emissions.</td></tr>
<tr><td>Additional comment</td><td>All flare specification and operation details/requirements are based on information provided by the equipment manufacturer.</td></tr>
</table>

Data/Parameter	**$EF_{EL,captive,y}$**
Unit	tCO_2/MWh
Description	CO_2 emission factor for electricity sourced by the captive off-grid electricity generator in year y
Source of data	Applicable default as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) (under option B2 of such methodological tool).
Value(s) applied	1.3
Choice of data or measurement methods and procedures	Data is determined as per applicable guidance of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01).
Purpose of data/parameter	Calculation of project emissions.
Additional comments	It is relevant to note that, as further explained in Section E.2, for the determination of the CO_2 emission factor for electricity consumed by the project activity, the PDD defines the following generic approach of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) regarding its determination by taking into account the sources for consumed electricity: *"Where case C.III has been identified, as a conservative simple approach, the emission factor for electricity generation should be the more conservative value between the emission factor determined as per guidance for scenario A and B respectively. This means that the more conservative value should be chosen between a) the result of applying either option A1 or A2 and b) the result of applying either option B1 or B2."* As further explained in Section E.2, the above-quoted options of the methodological tool (options A1, A2, B1 and B2) are thus all potentially applicable for the determination of $EF_{EL,grid,y}$ = $EF_{EL,captive,y}$ (with the determined value representing the most conservative (higher) value). In this context, the ex-ante determined default value for $EF_{EL,captive,y}$ is thus applied for the determination of $EF_{EL,captive,y}$ as per Option B2.

Data/Parameter	$\mathbf{EF_{EL,grid,y}}$
Data unit	tCO_2/MWh
Description	CO_2 emission factor for grid-sourced electricity in year y
Source of data	Applicable conservative default value as per the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) (under Option A.2 of such methodological tool).
Value(s) applied	1.3
Choice of data or measurement methods and procedures	Data is determined as per applicable guidance of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01).
Purpose of data	Calculation of project emissions.

Additional comment	It is relevant to note that, as further explained in Section E.2, for the determination of the CO_2 emission factor for electricity consumed by the project activity, the PDD defines the following generic approach of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) regarding its determination by taking into account the sources for consumed electricity: *"Where case C.III has been identified, as a conservative simple approach, the emission factor for electricity generation should be the more conservative value between the emission factor determined as per guidance for scenario A and B respectively. This means that the more conservative value should be chosen between a) the result of applying either option A1 or A2 and b) the result of applying either option B1 or B2."* As further explained in Section E.2, the above-quoted options of the methodological tool (options A1, A2, B1 and B2) are thus all potentially applicable for the determination of $EF_{EL,grid,y}$ = $EF_{EL,captive,y}$ (with the determined value representing the most conservative (higher) value). In this context, the ex-ante determined default value for $EF_{EL,grid,y}$ is thus applied for the determination of $EF_{EL,grid,y}$ as per Option A2.

Ex-ante determined parameters not used in the context of ex-post determination and calculation of emission reductions achieved by the project activity during the considered monitoring period:

The following ex-ante determined parameters (that are also included in the PDD) are not used for the purpose of ex-post determination of baseline emissions and project emissions achieved by the project activity during the considered monitoring period:

- Efficiency of the LFG capture system that will be installed in the project activity (η_{PJ})

- Default value for model correction factor to account for model uncertainties ($\varphi_{default}$)

- Oxidation factor (reflecting the amount of methane from the considered SWDS that is oxidized in the soil (or other material covering the waste)) (OX)

- Fraction of methane in the SWDS gas (volume fraction) (F)

- Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS ($DOC_{f,default}$)

- Methane correction factor (MCF)

- Fraction of degradable organic carbon in the waste type *j* (weight fraction) (DOCj)

- Decay rate for the waste type *j* (kj)

- Weight fraction of the waste type *j* (Wj)

As also outlined in the PDD, data for the above-listed parameters are used only in the context of ex-ante estimation of annual accumulated values for the "Amount of methane in the LFG which is destroyed or utilized by the project activity" ($F_{CH4,PJ,y}$) (in the context of ex-ante estimation of emission reductions to be achieved by the project activity during the 2nd 7-year renewable crediting period). Due to that, details for the above-listed parameters are not included in this Section as they are not relevant in the context of determination of emission reductions achieved by the project activity during the considered monitoring period. Relevant details for such not reported parameters are included in Section B.6.2 of the PDD.

D.2. Data and parameters monitored

Data/Parameter	**Management of SWDS**
Unit	Dimensionless
Description	Management of the SWDS
Measured/calculated/ Default	As per the adopted monitoring procedure for the project activity, the management of the AMC landfill is on an at least yearly frequency compared against the previously conceived original construction and operational design for this particular landfill in order to confirm that its overall management and operation (including relevant aspects related to landfilling practice) were not deliberately modified with the unique aim to increase generation of methane on site. As part of the performed checking, it is monitored whether any practice aiming to increase methane generation in the landfill has occurred or promoted. As required by ACM0001 (version 15.0), any change in the management of the landfill after the implementation of the project activity should be justified by referring to applicable technical or regulatory specifications.
Source of data	A technical evaluation was performed by an independent 3rd party engineering company. The findings from the latest performed evaluation are reported in a declaration document. As part of the performed technical evaluation, the current configuration and operational conditions of the AMC landfill were compared against the previously conceived design and operational conditions of the landfill prior to the implementation of the project activity on the basis of different sources, including inter alia: - Original design documents of the landfill (as described in the documentation required for all phases of the environmental licensing for the AMC landfill); - Applicable local or national regulations
Value(s) of monitored parameter	This most recently issued technical evaluation report confirms that no practices to increase methane generation at the AMC landfill have ever occurred (when compared to management and MSW landfilling practices prior to implementation of the project activity or after its implementation). Aspects, conditions and circumstances related to management of the landfill (e.g. waste disposal, waste covering, waste compacting, management of leachate, draining of rainwater, etc.) were not changed with an aim to increase methane generation on site.

	It is relevant to note that MSW management business (collection and disposal of MSW) in Brazil (and in other developing and even developed countries) has its own economics, dynamics, politics and related regulations. That makes MSW disposal activity for the AMC landfill and other similar landfills in Brazil completely independent from the CDM mechanism and/or potential revenues associated to the commercialization of CERs generated by project based methane destruction/utilization initiatives implemented in landfill sites. In the particular case of the AMC landfill, it is important to note that the landfill was designed and it has operated inter alia as per terms and conditions of the public service concession contracts for MSW management previously established with the Administration of the Municipality of Salvador. The design and operation of the AMC landfill is also under conformance with terms and conditions for the environmental licensing that were previously defined and of which indicators/operational requirements are regularly monitored by the competent environmental authority from Bahia State (INEMA). While the occurrence of changes in the quantitative condition related to MSW disposal in this landfill (such as the occurred increment in the amount of disposed MSW in the landfill as explained in the PDD) are completely independent from the CDM project activity, the project activity per se does not represent any incentive for promoting a change in the management of the landfill in order to increase the amount of methane generated in the site. The registered CDM project activity does not encompass any MSW management related measures. Currently, there is still no climate change of waste management policy in Brazil which would provide an incentive or a mandate to have MSW being disposed in landfills with better/improved LFG collection / destruction systems (such as the project's LFG collection and destruction system currently implemented at the AMC landfill). In this context, it is crucial to note that, regarding the amount of methane that is generated at the AMC landfill and collected by the project activity, as outlined in the PDD, significant amount of methane generated at the AMC landfill has unfortunately not been collected and destroyed as part of the operation of the project activity due to the lack of complete LFG collection infrastructure covering all regions of the very large AMC landfill.
Monitoring equipment	Not applicable. No measuring equipment is used for monitoring management of the AMC landfill.
Measuring/reading/recording frequency	Annual checking is performed.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed at BATTRE in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	As required by ACM0001 (version 15,0), any change in the management of the landfill after the implementation of the project activity will be justified by referring to technical or regulatory specifications and impacts of such changes in the determination of baseline emissions should in this case be taken into account appropriately. Such monitoring requirement will be used

	for the determination/confirmation of baseline emissions and/or confirmation of the project's implementation as described in the PDD (in terms of operation and management conditions of the landfill from which LFG is combusted).

Data/Parameter	$V_{t,wb,j}$
Unit	m^3 wet gas/h
Description	Volumetric flow of LFG stream in time interval *t* on a wet basis for *j* (where *j* is the LFG delivery pipeline to each internal combustion gas engine and LFG delivery pipeline to each flare).
Measured/calculated/ Default	Measured

Source of data	Measured as part of the operation of the project activity by applying appropriate monitoring instruments (22 LFG flow meters with recordable electronic signal). Continuously measurements are performed by 21 LFG flow meters which are installed in different positions along the LFG pipeline of the project activity as follows: - 2 identical LFG flow meters (one individual LFG flow meter for each operational high temperature enclosed flares) - 19 identical LFG flow meters (one individual LFG flow meter for each one of the 19 installed internal combustion gas engines)
Value(s) of monitored parameter	While related measurements are performed by installed 2 identical LFG flow meters (one flow meter for each operational flare) + installed 19 identical LFG flow meters (one flow meter for each internal combustion gas engine), the monitoring parameter $V_{t,wb,j}$ is thus measured, recorded and reported on the basis of the following 21 sub-parameters: - $V_{t,wb,flare-1}$: Volumetric flow of LFG to Flare 1 - $V_{t,wb,flare-2}$: Volumetric flow of LFG to Flare 2 - $V_{t,wb,engine-1}$: Volumetric flow of LFG to the internal combustion gas engine 1 - $V_{t,wb,engine-2}$: Volumetric flow of LFG to the internal combustion gas engine 2 - $V_{t,wb,engine-3}$: Volumetric flow of LFG to the internal combustion gas engine 3 - $V_{t,wb,engine-4}$: Volumetric flow of LFG to the internal combustion gas engine 4 - $V_{t,wb,engine-5}$: Volumetric flow of LFG to the internal combustion gas engine 5 - $V_{t,wb,engine-6}$: Volumetric flow of LFG to the internal combustion gas engine 6 - $V_{t,wb,engine-7}$: Volumetric flow of LFG to the internal combustion gas engine 7 - $V_{t,wb,engine-8}$: Volumetric flow of LFG to the internal combustion gas engine 8 - $V_{t,wb,engine-9}$: Volumetric flow of LFG to the internal combustion gas engine 9 - $V_{t,wb,engine-10}$: Volumetric flow of LFG to the internal combustion gas engine 10 - $V_{t,wb,engine-11}$: Volumetric flow of LFG to the internal combustion gas engine 11 - $V_{t,wb,engine-12}$: Volumetric flow of LFG to the internal combustion gas engine 12 - $V_{t,wb,engine-13}$: Volumetric flow of LFG to the internal combustion gas engine 13 - $V_{t,wb,engine-14}$: Volumetric flow of LFG to the internal combustion gas engine 14 - $V_{t,wb,engine-15}$: Volumetric flow of LFG to the internal combustion gas engine 15 - $V_{t,wb,engine-16}$: Volumetric flow of LFG to the internal combustion gas engine 16 - $V_{t,wb,engine-17}$: Volumetric flow of LFG to the internal combustion gas engine 17 - $V_{t,wb,engine-18}$: Volumetric flow of LFG to the internal combustion gas engine 18 - $V_{t,wb,engine-19}$: Volumetric flow of LFG to the internal combustion gas engine 19 The set of monthly emission reduction calculation spreadsheets (that are enclosed to this Monitoring Report) includes all every-minute records of measurements of LFG flow sent to each one of the installed 3 high temperature enclosed flare and to each one of the installed 19 internal combustion gas engines valid for the considered monitoring period (records of the sub-parameters $V_{t,wb,flare-1}$, $V_{t,wb,flare-2}$, $V_{t,wb,flare-3}$ and $V_{t,wb,engine-1}$, $V_{t,wb,engine-2}$, (…), $V_{t,wb,engine-19}$).

Monitoring equipment

Specifications and calibration details for the 2 identical LFG flow meters used during the considered monitoring period for measuring the flow of LFG sent to the flares ($V_{t,wb,flare-1}$ and $V_{t,wb,flare-2}$):

- Manufacturer: SMAR Equipamentos Ind. Ltda.
- Model: LD301
- Accuracy: ±1%
- Serial Numbers:

Flare Number	Serial Number
Flare 1 ($V_{t,wb,flare-1}$)	132165
Flare 2 ($V_{t,wb,flare-2}$)	U576610

- Required Calibration frequency [5]: Calibration events are to be performed every 1 year
- Details for performed calibration events valid for the considered monitoring period:

Flare Number	Calibration event date(s)	Validity of the performed calibration event(s)	Entity/company responsible for performing the calibration event(s)	Calibration Certificate Number(s)
Flare 1	24/01/2016	23/01/2017	Medição Soluções Metrológicas Integradas	22207/16
	24/01/2017	23/01/2018	Works Serviços Ltda.	4297
Flare 2	20/05/2016	19/05/2017	Medição Soluções Metrológicas Integradas	131724/16
	10/02/2017	09/02/2018	Works Serviços Ltda.	4320

Specifications and calibration details for the identical 19 LFG flow meters used for measuring the flow of LFG sent to the internal combustion gas engines ($V_{t,wb,engine-1}$, $V_{t,wb,engine-2}$, (…), $V_{t,wb,engine-19}$):

- Manufacturer: Emerson Electric Co. (former Rosemount Inc.)
- Model: Rosemount 3051S
- Accuracy: ±1.0%
- Serial numbers:

Engine Number	Serial Number
Engine 1 ($V_{t,wb,engine-1}$)	51453
Engine 2 ($V_{t,wb,engine-2}$)	51429
Engine 3 ($V_{t,wb,engine-3}$)	51404
Engine 4 ($V_{t,wb,engine-4}$)	51406

[5] The reported required calibration frequencies for all installed monitoring instruments/equipment are as per the recommendations of related equipment/instrument manufacturers. The monitoring plan from the PDD and ACM0001 (version 15.0) do not specify any explicit frequency for the calibration of such equipment/instruments. The PDD includes the following general disclaimer:

> *"Calibration events in monitoring instruments/equipment will be periodically and appropriately performed as per applicable frequency, procedures and methods established or recommended by instrument/ equipment manufacturer, applicable national/international standards and/or best practice, as available."*

Engine 5 ($V_{t,wb,engine-5}$)	51462
Engine 6 ($V_{t,wb,engine-6}$)	51408
Engine 7 ($V_{t,wb,engine-7}$)	51407
Engine 8 ($V_{t,wb,engine-8}$)	51451
Engine 9 ($V_{t,wb,engine-9}$)	51409
Engine 10 ($V_{t,wb,engine-10}$)	51431
Engine 11 ($V_{t,wb,engine-11}$)	51410
Engine 12 ($V_{t,wb,engine-12}$)	51412
Engine 13 ($V_{t,wb,engine-13}$)	51428
Engine 14 ($V_{t,wb,engine-14}$)	51450
Engine 15 ($V_{t,wb,engine-15}$)	51430
Engine 16 ($V_{t,wb,engine-16}$)	51411
Engine 17 ($V_{t,wb,engine-17}$)	51452
Engine 18 ($V_{t,wb,engine-18}$)	51405
Engine 19 ($V_{t,wb,engine-19}$)	51461

- Required Calibration frequency: Calibration events are to be performed every 1 year.
- Details for performed calibration events valid for the considered monitoring period:

Engine Number	Calibration event date(s)	Validity of the performed calibration event(s)	Entity/company responsible for performing the calibration event(s	Calibration Certificate Number(s)
Engine 1	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67407/16
Engine 2	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67448/16
	09/02/2017	08/02/2018	Bahia Control	BC-001
	08/02/2018	07/02/2019	Cermantech Manutenção Industrial	CM-10
Engine 3	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67516/16
	04/05/2017	03/05/2018	Bahia Control	BC-018
	26/04/2018	25/04/2019	Cermantech Manutenção Industrial	CM-027
Engine 4	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67544/16
	10/02/2017	09/02/2016	Bahia Control	BC-002
	08/02/2018	07/02/2019	Cermantech Manutenção Industrial	CM-11
Engine 5	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67619/16
	03/05/2017	02/05/2018	Bahia Control	BC-017
	24/04/2018	23/04/2019	Cermantech Manutenção Industrial	CM-026
Engine 6	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67630/16
	30/03/2017	29/03/2018	Bahia Control	BC-003
	26/03/2018	25/03/2019	Cermantech Manutenção Industrial	CM-12
Engine 7	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67640/16
	03/05/2017	02/05/2018	Bahia Control	BC-016
	24/04/2018	23/04/2019	Cermantech Manutenção Industrial	CM-025
Engine 8	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67740/16

	30/03/2017	29/03/2018	Bahia Control	BC-005
	26/03/2018	25/03/2019	Cermantech Manutenção Industrial	CM-13
Engine 9	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67829/16
	18/04/2017	17/04/2018	Bahia Control	BC-015
	16/04/2018	15/04/2019	Cermantech Manutenção Industrial	CM-024
Engine 10	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67848/16
	30/03/2017	29/03/2018	Bahia Control	BC-004
	27/03/2018	26/03/2019	Cermantech Manutenção Industrial	CM-14
Engine 11	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67546/16
	18/04/2017	17/04/2018	Bahia Control	BC-014
	16/04/2018	15/04/2019	Cermantech Manutenção Industrial	CM-023
Engine 12	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67628/16
	04/04/2017	03/04/2018	Bahia Control	BC-006
	27/03/2018	26/03/2019	Cermantech Manutenção Industrial	CM-15
Engine 13	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67629/16
	12/04/2017	11/04/2018	Bahia Control	BC-013
	09/04/2018	08/04/2019	Cermantech Manutenção Industrial	CM-022
Engine 14	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67641/16
	05/04/2017	04/04/2018	Bahia Control	BC-007
	04/04/2018	03/04/2019	Cermantech Manutenção Industrial	CM-16
Engine 15	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67722/16
	18/04/2017	17/04/2018	Bahia Control	BC-012
	12/04/2018	11/04/2019	Cermantech Manutenção Industrial	CM-021
Engine 16	10/05/2016	09/05/2017	Medição	67779/16

				Soluções Metrológicas Integradas	
	07/04/2017	06/04/2017	Bahia Control	BC-008
	06/04/2018	05/04/2019	Cermantech Manutenção Industrial	CM-17
Engine 17	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67857/16
	12/04/2017	11/04/2018	Bahia Control	BC-011
	10/04/2018	09/04/2019	Cermantech Manutenção Industrial	CM-020
Engine 18	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67935/16
	06/04/2017	05/04/2018	Bahia Control	BC-009
	04/04/2018	03/04/2019	Cermantech Manutenção Industrial	CM-018
Engine 19	10/05/2016	09/05/2017	Medição Soluções Metrológicas Integradas	67941/16
	12/04/2017	11/04/2018	Bahia Control	BC-010
	10/04/2018	09/04/2019	Cermantech Manutenção Industrial	CM-019

Measuring/reading/recording frequency	Continuous measurements are recorded and reported with every-minute frequency.
Calculation method (if applicable)	Not applicable
QA/QC procedures	Monitoring equipment/instruments are calibrated and maintained as per instrument specifications and/or recommendations of manufacturer. Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed at BATTRE in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of baseline emissions

Additional comments	The design and functioning of the installed 19 identical LFG flow meters (used for measuring the flow of LFG sent to each of the 19 internal combustion gas engines) ensure that measurement data is automatically converted and recorded in normal cubic meters per hour (Nm^3/h). Due to that, as explained in Section E.1, measurements of LFG pressure and LFG temperature are not required for determining normalized LFG flow values of the calculation sub-parameters $V_{t,n,wb,engine-n}$ (where engine-n = engine-1, engine-2, (…), engine-19). in the context of calculation of achieved emission reductions. Due to that, reported values of the calculation sub-parameters $V_{t,n,wb,engine-n}$ (where engine-n = engine-1, engine-2, (…), engine-19).are thus equivalent to values of $V_{t,wb,n,engine-n}$ and are thus directly used for the determination of the amount of methane in the LFG flared by the project activity ($F_{CH4,flared,y}$) as per Option C of the applicable methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (measurements of volume flow in a wet basis) (as outlined in the monthly emission reduction calculation spreadsheets enclosed to this Monitoring Report). For the particular case of the 2 identical LFG flow meters (used for continuously measuring the flow of LFG sent to each one of the 2 operational flares), the design and functioning of such instruments do not allow performed measurements being automatically converted into normal cubic meter per hour (Nm^3/h). Thus, measurements of LFG pressure and LFG temperature (monitoring parameters "Temperature of the LFG stream in time interval *t*" (T_t) and "Pressure of the LFG stream in time interval t" (P_t) respectively) are thus considered for converting measurements of $V_{t,wb,flare-n}$ (where flare-n = flare-1 and flare-2) into normalized values. As outlined in Section E.1, this is required for the determination of values for the calculation sub-parameters $V_{t,n,wb,flare-n}$ (where flare-n = flare-1 and flare-2).

Data/Parameter	$\mathbf{V_{CH4,t,wb,j}}$
Unit	m^3CH_4/m^3 wet gas
Description	Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis for *j* (where *j* is the LFG delivery pipeline to each internal combustion gas engine and LFG delivery pipeline to each flare)
Measured/calculated/ Default	Measured
Source of data	Measured as part of the operation of the project activity by applying appropriate monitoring instruments (continuous CH_4 content gas analyser) with recordable electronic signal).
Value(s) of monitored parameter	The set of monthly emission reduction calculation spreadsheets (that are enclosed to this Monitoring Report) includes measurement data for $v_{CH4,t,wb}$ that are recorded and reported for with an every-minute frequency.

Monitoring equipment	*Specifications and calibration details for the installed continuous CH_4 content gas analyser:* - Manufacturer: Emerson Electric Co. (former Rosemount Inc.) - Model: X-STREAM X2 Series - Accuracy: ±2% - Serial Number: NS 53159 - Required calibration frequency: Calibration events are to be performed every 2 weeks. - Dates and validity of performed calibration events valid for the considered monitoring period (dd/mm): - Entity/company responsible for performing the calibration events: all calibration events were performed by trained responsible staff of the project participant BATTRE by following applicable internal working procedures. Calibration events valid for the considered monitoring period were performed by using certified span gas cylinders with a known CH_4 composition. Certified span gases utilized for performing the calibration events valid for the considered monitoring period: - Gas cylinders with a calibration mixture of 50.00 cmol/mol of CH_4 and 50.00 cmol/mol of CO_2: cylinder n° 10295, certificate number 1150/16 supplied by Linde Gases Ltda. - Gas cylinders with a calibration mixture of 50.01 cmol/mol of CH_4 and 49.99 cmol/mol of CO_2: cylinder n° 29756, certificate number 110/17 supplied by Linde Gases Ltda. - Gas cylinders with a calibration mixture of 50.01 cmol/mol of CH_4 and 49.99 cmol/mol of CO_2: cylinder n° 112312, certificate number 3727/17 supplied by Linde Gases Ltda.
Measuring/reading/recording frequency	Continuously measurements are recorded/reported every minute.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Monitoring equipment/instruments are calibrated and maintained as per instrument specifications and/or recommendations of manufacturer. Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed at BATTRE in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	**T_t**
Unit	K
Description	Temperature of the LFG stream in time interval *t*
Measured/calculated/ Default	Measured

Source of data	Measured as part of the operation of the project activity by applying appropriate monitoring instrument (LFG temperature sensors with recordable electronic signal). Measurements of LFG temperature are primarily recorded and reported in ^{o}C. Recorded/reported data is converted into Kelvin (K) and data is also reported in this unit, thus meeting the related monitoring requirement as per the PDD.
Value(s) of monitored parameter	While related measurements are performed by installed 2 identical temperature sensors (one temperature sensor for each operational flare) the monitoring parameter T_t is thus measured, recorded and reported on the basis of the following 2 sub-parameters: - $T_{t,flare-1}$: Volumetric flow of LFG to Flare 1 - $T_{t,flare-2}$: Volumetric flow of LFG to Flare 2
Monitoring equipment	*Specifications and calibration details for the LFG temperature sensor used for measuring temperature of LFG sent to Flare 1 ($T_{t,flare-1}$):* - Manufacturer: SMAR Equipamentos Ind. Ltda. - Model: TT-301 - Accuracy: ±1% - Serial Number (S/N): 67895-2010 - Required calibration frequency: calibration events are to be performed yearly - Date(s) and validity for performed calibration event(s) valid for the considered monitoring period: - Calibration event dated 24/01/2016 (Calibration Certificate 131744/16, issued by Medição Soluções Metrológicas Integradas), valid until 23/01/2017 - Calibration event dated 23/01/2017 (Calibration Certificate 4296, issued by Works Serviços Ltda.), valid until 22/01/2018 *Specifications and calibration details for the LFG temperature sensor used for measuring temperature of LFG sent to Flare 2 ($T_{t,flare-2}$):* - Manufacturer: SMAR Equipamentos Ind. Ltda. - Model: TT-301 - Accuracy: ±1% - Serial Number (S/N): 67895-2010 - Required calibration frequency: calibration events are to be performed yearly - Date(s) and validity for performed calibration event(s) valid for the considered monitoring period: - Calibration event dated 26/05/2016 (Calibration Certificate 131609/16, issued by Medição Soluções Metrológicas Integradas), valid until 25/05/2017 - Calibration event dated 10/02/2017 (Calibration Certificate 4322, issued by Works Serviços Ltda.), valid until 09/02/2018 - Calibration event dated 12/01/2018 (Calibration Certificate 5024, issued by Works Serviços Ltda.), valid until 11/01/2018
Measuring/reading/recording frequency	Continuously measurements are recorded/reported every minute.
Calculation method (if applicable)	Not applicable.

QA/QC procedures	Monitoring equipment/instruments are calibrated and maintained as per instrument specifications and/or recommendations of manufacturer. Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed at BATTRE in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	**P_t**
Unit	Pa
Description	Pressure of the LFG stream in time interval *t*
Measured/calculated/ Default	Measured
Source of data	Measured as part of the operation of the project activity by applying appropriate monitoring instrument (LFG pressure sensor with recordable electronic signal). Measurements of LFG pressure are primarily recorded and reported in milibars (mbar). Recorded/reported data is converted into Pascal (Pa) and data is also reported in this unit, thus meeting the related monitoring requirement as per the PDD.
Value(s) of monitored parameter	The set of monthly emission reduction calculation spreadsheets (that are enclosed to this Monitoring Report) includes measurement data for P_t that are recorded and reported for with an every-minute frequency.
Monitoring equipment	Measurements of pressure of LFG sent to the flares are performed by one installed LFG pressure sensor (that is installed in the main LFG pipeline within the flaring facility in a section between the centrifugal blowers and the high temperature enclosed flares). *Specifications and calibration details for the LFG pressure sensor used for measuring temperature of LFG sent to the flares:* - Manufacturer: Pressgage instrumentos de Medição e Controle Ltda. - Model: TPI-PRESS - Accuracy: ±1.5% - Serial Number: 185053 - Required calibration frequency: calibration events are to be performed yearly. - Date(s) for performed calibration event(s) valid for the considered monitoring period: Calibration event dated 11/01/2017 (issued by Medição Soluções Metrológicas Integradas). - Validity of the performed calibration event(s): The calibration event dated 11/01/2017 is valid until 10/01/2018.
Measuring/reading/recording frequency	Continuously measurements are recorded/reported every minute.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Monitoring equipment/instruments are calibrated and maintained as per instrument specifications and/or recommendations of manufacturer. Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed at BATTRE in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of baseline emissions

Additional comments	-

Data/Parameter	**$EC_{PJ,grid,y}$**
Unit	MWh
Description	Amount of grid electricity consumed by the project activity during the year *y*
Measured/calculated/ Default	Measured.
Source of data	Measured as part of the operation of the project activity by applying appropriate monitoring instrument (one electricity meter with recordable electronic signal).
Value(s) of monitored parameter	Monthly records of grid-sourced electricity consumption valid for the considered monitoring period:
Monitoring equipment	*Specifications and calibration details for the electricity meter used for measuring consumption of grid-sourced electricity:* - Manufacturer: KRON Instrumentos Elétricos Ltda. - Model: MULTIMEDIDOR MKM-D - Accuracy: ±0.2% - Serial Number (S/N): 672850 - Required calibration frequency (as specified by the monitoring methodology/ methodological tool): As per the PDD, all monitoring equipment must be calibrated periodically. The "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" establishes the following regarding maintenance and calibration for electricity meters: "*Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance to appropriate national / international standards/requirements and/or best practice.*" - Calibration frequency (as per the recommendation of the meter manufacturer): it is important to note that the installed meter is approved/certified by INMETRO (The Brazilian national authority for metrology and standardization issues), and it is thus in conformance with INMETRO's requirements for maintenance and testing of electricity meters. According to the instruments manufacturer, the meter is to be calibrated every 5 years. A calibration frequency of 5 years is thus adopted. - Dates and validity of performed calibration events valid for the considered monitoring period: Calibration event dated 24/01/2016 valid until 23/01/2021, as indicated in the Calibration Certificate Number 141819-101, issued by KRON Instrumentos Elétricos Ltda. - Electricity meter with S/N 1995567: Calibration event dated 02/10/2018 valid until 01/10/2013, as indicated in the Calibration Certificate Number 199556780794/18, issued by CEIME Calibração e Comércio de Instrumentos Ltda.
Measuring/reading/recording frequency	Accumulated monthly measurement values for consumption of grid-sourced electricity are recorded once a month.
Calculation method	-

(if applicable)	
QA/QC procedures	Monitoring equipment/instruments are calibrated and maintained as per instrument specifications and/or recommendations of manufacturer. Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed at BATTRE in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of project emissions
Additional comments	As outlined in the PDD, all electricity generated by the grid-connected electricity generation infrastructure fuelled by LFG (of which the set of 19 internal combustion gas engines combusting collected LFG represents major components) and consumed by equipment of the project's LFG collection and flaring infrastructure (e.g. centrifugal blowers, control system, monitoring instruments/equipment, etc.) is to be regarded/accounted as consumption of grid-sourced electricity (with related project emissions accounted accordingly) as a conservative approach. Under normal circumstances, very small share of the net-generated electricity by the project's grid-connected electricity generation infrastructure fuelled by LFG is continuously supplied to the equipment of the project's LFG collection and flaring infrastructure, with additional very small share being continuously used for meeting the even smaller electricity demand of other facilities located within the limits of the AMC landfill and with the remaining larger share of net generated electricity being exported to the grid through a high voltage power substation connected to an electricity transmission line within the grid. Under unusual circumstances when the grid-connected electricity generation infrastructure fuelled by LFG is not under operational status (and with supply of grid-sourced electricity to the landfill site under normal conditions), the electricity demand of all equipment of the project's LFG collection and flaring infrastructure is thus directly met by supply of grid-sourced electricity. Under both circumstances, consumption of electricity regarded as supplied by the grid is measured by one common installed electricity meter. The electricity meter used for monitoring the parameter $EC_{PJ,grid,y}$ provides accumulated measurement records for grid-sourced electricity consumed by the project's LFG collection and flaring infrastructure. Accounting all consumption by the project activity of electricity generated by the grid-connected electricity generation infrastructure (fuelled uniquely by LFG) (of which the set of 19 internal combustion gas engines represents major components) represents a conservative measure which is under conformance with the following disclaimer included in the PDD: *"While no emission reductions due to displacement of a more-GHG-intensive service (due to generation of electricity using collected LFG as fuel) are eligible and/or claimable under the project activity, for sake of conservativeness and integrity, any consumption by the project activity of electricity generated by the grid-connected 20.1 MW electricity generation infrastructure (entirely fuelled by LFG and located within the geographical limits of the AMC landfill (for which the set of internal combustion gas engines represents the major components)) will thus always be regarded and accounted as consumption of grid-sourced electricity (with related monitoring (data measurements and records) being performed and with project emissions being determined ex-post accordingly)."* Meeting of electricity demand of the project's LFG collection and flaring

	infrastructure with electricity generated by installed backup captive off-grid electricity generator is only expected to occur under very unusual and improbable situations when supply of grid-sourced electricity to the landfill site is not available[6]. Under such circumstances, electricity consumption by the project activity is performed by an independent electricity meter located/positioned between such backup captive electricity generator (fuelled by diesel) and the project's equipment within the internal wiring for electricity supply.

Data/Parameter	**$EF_{grid,OM,y} = EF_{grid,OM-DD,y}$**
Unit	CO_2/MWh
Description	Operating margin CO_2 emission factor in year *y* = Dispatch data analysis operating margin CO_2 emission factor in year *y*.
Measured/calculated/ Default	Data will be determined as per applicable calculation guidance for dispatch data analysis operating margin CO_2 emission factor of the methodological tool "Tool to calculate the emission factor for an electricity system" (version 04.0).
Source of data	The selected annual average values valid for years 2012 (years encompassing the whole considered monitoring period) are calculated by the DNA of Brazil and are made public available at the website of the DNA of Brazil: http://www.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/emissao_despacho.html
Value(s) of monitored parameter	Year 2012 - 0.6228 tCO_2/MWh
Monitoring equipment	Not applicable.
Measuring/reading/recording frequency	Value(s) valid for the years encompassed by the considered monitoring period are to be used.
Calculation method (if applicable)	Values are calculated by the DNA of Brazil as per applicable guidance of the calculation method "dispatch data analysis operating margin CO_2 emission factor" of the "Tool to calculate the emission factor for an electricity system".
QA/QC procedures	Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed at BATTRE in accordance with detailed working instructions that are included in the company's quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation project emissions.

[6] Both the project's LFG collection and flaring infrastructure and the grid-connected electricity generation infrastructure fuelled by LFG (of which the set of 19 internal combustion represents major components) are connected to the National Electricity Grid of Brazil through a high voltage transmission line which is made very reliable and is well controlled by its electricity transmission/distribution operators (by taking into account its importance for the supply of electricity to Salvador region). Due to that, interruptions in the supply of grid-sourced electricity to the project activity are regarded as very unusual and improbable.

Additional comments	It is relevant to note that, as further explained in Section E.2, for the determination of the CO_2 emission factor for electricity consumed by the project activity, the PDD defines the following generic approach of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) regarding its determination by taking into account the sources for consumed electricity: *"Where case C.III has been identified, as a conservative simple approach, the emission factor for electricity generation should be the more conservative value between the emission factor determined as per guidance for scenario A and B respectively. This means that the more conservative value should be chosen between a) the result of applying either option A1 or A2 and b) the result of applying either option B1 or B2.*" As further explained in Section E.2, the above-quoted options of the methodological tool (options A1, A2, B1 and B2) are thus all potentially applicable for the determination of $EF_{EL,grid,y} = EF_{EL,captive,y}$ (with the determined value representing the most conservative (higher) value). In this context, monitored value for $EF_{grid,OM,y} = EF_{grid,OM\text{-}DD,y}$ is applied for the determination of $EF_{EL,grid,y}$ as per Option A1.

Data/Parameter	**$Op_{j,h}$**
Unit	-
Description	Operation of the equipment that consumes LFG (i.e. set of 19 internal combustion gas engines (as additional/alternative methane destruction devices)).
Measured/calculated/ Default	For each equipment unit *j* using the LFG monitor that the plant is operating in hour h by the monitoring any one or more of the following three parameters: (a) Temperature. Determine the location for temperature measurements and minimum operational temperature based on manufacturer's specifications of the burning equipment. Document and justify the location and minimum threshold in the PDD; (b) Flame. Flame detection system is used to ensure that the equipment is in operation; (c) Products generated. Monitor the generation of steam for the case of boilers and air-heaters and glass for the case of glass melting furnaces. This option is not applicable to brick kilns. $O_{pj,h} = 0$ when: (a) One of more temperature measurements are missing or below the minimum threshold in hour h (instantaneous measurements are made at least every minute); (b) Flame is not detected continuously in hour h (instantaneous measurements are made at least every minute); (c) No products are generated in the hour h. Otherwise, $O_{pj,h} = 1$
Source of data	The electronic control system for each internal combustion gas engine continuously monitors operational status of the engine (internal combustion gas engine under operation "*on*" or not under operation "*off*"), generating recordable electronic signal.

Value(s) of monitored parameter	While the operational status for each individual internal combustion gas engine consuming LFG is independently monitored, the monitoring parameter $O_{pj,h}$ is recorded and reported on the basis of the following sub-parameters: - $Op_{engine\text{-}1,h,}$: Operation of the internal combustion gas engine 1 - $Op_{engine\text{-}2,h}$: Operation of the internal combustion gas engine 2 - $Op_{engine\text{-}3,h}$: Operation of the internal combustion gas engine 3 - $Op_{engine\text{-}4,h}$: Operation of the internal combustion gas engine 4 - $Op_{engine\text{-}5,h}$: Operation of the internal combustion gas engine 5 - $Op_{engine\text{-}6,h}$: Operation of the internal combustion gas engine 6 - $Op_{engine\text{-}7,h}$: Operation of the internal combustion gas engine 7 - $Op_{engine\text{-}8,h}$: Operation of the internal combustion gas engine 8 - $Op_{engine\text{-}9,h}$: Operation of the internal combustion gas engine 9 - $Op_{engine\text{-}10,h}$: Operation of the internal combustion gas engine 10 - $Op_{engine\text{-}11,h}$: Operation of the internal combustion gas engine 11 - $Op_{engine\text{-}12,h}$: Operation of the internal combustion gas engine 12 - $Op_{engine\text{-}13,h}$: Operation of the internal combustion gas engine 13 - $Op_{engine\text{-}14,h}$: Operation of the internal combustion gas engine 14 - $Op_{engine\text{-}15,h}$: Operation of the internal combustion gas engine 15 - $Op_{engine\text{-}16,h}$: Operation of the internal combustion gas engine 16 - $Op_{engine\text{-}17,h}$: Operation of the internal combustion gas engine 17 - $Op_{engine\text{-}18,h}$: Operation of the internal combustion gas engine 18 - $Op_{engine\text{-}19,h}$: Operation of the internal combustion gas engine 19 For each one of the 19 installed internal combustion gas engines, records for every-minute operational status of the engine (internal combustion gas engine under operation ("*on*") = 1 or not under operation ("*off*") = 0) are made available in the emission reduction calculation spreadsheets.
Monitoring equipment	Not applicable.
Measuring/reading/recording frequency	Values are reported on a minute basis.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed at BATTRE in accordance with detailed working instructions that are included in the company's quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation baseline emissions.
Additional comments	In the particular case of the project activity the only equipment that consumes LFG (and for which the monitoring parameter $Op_{j,h}$ is applicable to) are the internal combustion gas engines (additional/alternative destruction methane devices). As per ACM0001 (version 15.0), the monitoring parameter $Op_{j,h}$ is not applicable to the project's high temperature enclosed flares.

Data/Parameter	**$T_{EG,m}$**
Unit	^{o}C
Description	Temperature in the exhaust gas of the enclosed flare in minute *m*
Measured/calculated/ Default	Measured
Source of data	Measured as part of the operation of the project activity by applying appropriate monitoring instruments (thermocouples) (with recordable electronic signal). Continuously measurements are performed by 2 thermocouples (each thermocouple installed in the upper section of each one of the 2 available high temperature enclosed flares).
Value(s) of monitored parameter	Values for each one of the installed 2 high temperature enclosed flares are reported in the monthly emission reduction calculation spreadsheets (that are enclosed to this Monitoring Report). Measurement data is recorded and reported with an every-minute frequency. While measurements are performed by 2 thermocouples (one thermocouple installed in the upper section of each individual operational flare), the monitoring parameter $T_{EG,m}$ is measured, recorded and reported on the basis of the following sub-parameters: - $T_{EG,m,flare-1}$: Temperature in the exhaust gas of Flare 1 - $T_{EG,m,flare-2}$: Temperature in the exhaust gas of Flare 2

Monitoring equipment	*Specifications and calibration details for the installed/utilized thermocouples:* *Thermocouple used for measuring $T_{EG,m,flare-1}$ (Flare 1):* - Manufacturer: ECIL - Accuracy: ±2.0ºC - Serial Number: 15203/128885 - Calibration requirements: frequency (as specified by the monitoring methodology/tool): periodically calibrated by an officially accredited entity - Calibration frequency (as per the application of the monitoring plan): yearly - Date(s) and validity for performed calibration event(s) valid for the considered monitoring period: - Calibration event dated 20/05/2016 (Calibration Certificate 131704/16, issued by Medição Soluções Metrológicas Integradas), valid until 19/05/2017 - Calibration event dated 10/02/2017 (Calibration Certificate 4321, issued by Works Serviços Ltda.), valid until 09/02/2018 - Calibration event dated 12/01/2018 (Calibration Certificate 5025, issued by Works Serviços Ltda.), valid until 11/01/2019 *Thermocouple used for measuring $T_{EG,m,flare-2}$ (Flare 2):* - Manufacturer: ECIL - Accuracy: ±2.0ºC - Serial Number: 95719/1/2 - Calibration frequency (as specified by the monitoring methodology/tool): periodically calibrated by an officially accredited entity - Calibration frequency (as per the application of the monitoring plan): yearly - Date(s) and validity for performed calibration event(s) valid for the considered monitoring period: - Calibration event dated 26/05/2016 (Calibration Certificate 131609/16, issued by Medição Soluções Metrológicas Integradas), valid until 19/05/2017 - Calibration event dated 10/02/2017 (Calibration Certificate 4322, issued by Works Serviços Ltda.), valid until 09/02/2018 - Calibration event dated 12/01/2018 (Calibration Certificate 5024, issued by Works Serviços Ltda.), valid until 11/01/2019
Measuring/reading/recording frequency	Continuously measurements are recorded/reported every minute.
Calculation method (if applicable)	-
QA/QC procedures	Monitoring equipment/instruments are calibrated and maintained as per instrument specifications and/or recommendations of manufacturer. Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed at BATTRE in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of baseline emissions

Additional comments	Measurements outside the operational temperature specified/recommended by the manufacturer may indicate that the flare is not functioning correctly and may require maintenance. Unexpected changes such as a sudden increase/drop in temperature can occur for different reasons. As part of the monitoring procedure, these events are noted in the site records along with any corrective action that was implemented to correct the issue. Measurements are required to determine if manufacturer's flare specifications for operating temperature are met.

Data/Parameter	**$Flame_m$**
Unit	Flame status "*on*" or flame status "*off*"
Description	Flame detection of flare in the minute *m*
Measured/calculated/ Default	Measured
Source of data	Continuously measurements are performed by Ultra violet (UV) flame detectors (one UV flame detector for each installed high temperature enclosed flare with recordable electronic signal). For each one of the flares, whenever flame is detected in the flare, flame status "on" or "1" value is attributed. Whenever no flame is detected in the flare, flame status "off" or "0" is attributed.
Value(s) of monitored parameter	Values for each one of the installed 2 high temperature enclosed flares are reported in the monthly emission reduction calculation spreadsheets (that is enclosed to this Monitoring Report). Measurement data is recorded and reported with an every-minute frequency. While measurements are performed by 2 UV flame detectors (one UV flame detector installed in each individual installed flare), the monitoring parameter Flamem is thus measured, recorded and reported on the basis of the following sub-parameters: - $Flame_{m,flare\text{-}1}$: Flame detection in Flare 1 - $Flame_{m,flare\text{-}2}$: Flame detection in Flare 2
Monitoring equipment	*Specifications and calibration details for the installed/utilized UV Flame detectors:* *UV Flame detector for measuring* $Flame_{m,flare\text{-}1}$ *(Flare 1)*: - Manufacturer: SELCON Sistemas Eletrônicos de Controle Ltda. - Model: SEL-SV-UL-K4 - Serial Number: 323730808 - Calibration frequency: No calibration is required as the equipment has a self-checking function. *UV Flame detector for measuring* $Flame_{m,flare\text{-}2}$ *(Flare 2)*: - Manufacturer: SELCON Sistemas Eletrônicos de Controle Ltda. - Model: SEL-SV-UL-K4 - Serial Number: 55600905 - Calibration frequency: No calibration is required as the equipment has a self-checking function.
Measuring/reading/recording frequency	Continuously measurements are recorded/reported every minute.

Calculation method (if applicable)	Not applicable
QA/QC procedures	Monitoring equipment/instruments are calibrated and maintained as per instrument specifications and/or recommendations of manufacturer. Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed at BATTRE in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	**$Maintenance_y$**
Unit	Calendar dates
Description	Maintenance events completed in year *y* as monitored by the project participants.
Measured/calculated/ Default	-
Source of data	Maintenance logs
Value(s) of monitored parameter	The following relevant maintenance events (inspection and maintenance services) are applicable for the flares during the considered monitoring period: - 03/04/2017: General inspection/maintenance service on Flares 1, 2, 3 and 4 (incl. inspection of the condition of the flares isolation ceramics revetment material, checking of conditions of the LPG supply valve for pilot flames, checking of condition/function of the air inlet dumpers, checking of the conditions of the thermocouples, checking of the condition of the UV flame detectors, checking of the condition of the flame arrester valves, checking of the conditions of the LFG injectors, checking of painting conditions). - 30/09/2018: General inspection/maintenance service on Flares 1, 2, 3 and 4 (incl. inspection of the condition of the flares isolation ceramics revetment material, checking of conditions of the LPG supply valve for pilot flames, checking of condition/function of the air inlet dumpers, checking of the conditions of the thermocouples, checking of the condition of the UV flame detectors, checking of the condition of the flame arrester valves, checking of the conditions of the LFG injectors, checking of painting conditions). As per the applied maintenance practice for the project activity, general inspection/maintenance services on the flares are opportunely performed during planned or unplanned interruptions of operation of the flares within a time interval between 2 performed inspection/maintenance services events never higher than 6 months.
Monitoring equipment	Not applicable.
Measuring/reading/recording frequency	Not applicable.

Calculation method (if applicable)	Not applicable.
QA/QC procedures	The maintenance event logs and documentation for the whole project activity are recorded as per requirement of the company's ISO 9001 and ISO 14001 certified quality and control (QA/QC) and environmental management (EMS) system that is implemented for activities undertaken at the AMC landfill.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	These dates are required so that they can be compared to the maintenance schedule to check that maintenance events were completed within the minimum time between maintenance events specified by the manufacturer ($SPEC_{flare}$).

Data/Parameter	**$FC_{LPG,y}$**
Unit	ton
Description	Quantity of LPG consumed by the project activity in year *y*
Measured/calculated/ Default	Measured
Source of data	Monitored values of $FC_{LPG,y}$ are based on measurements performed by the local LPG distribution company Cia Ultragas S.A. as part of LPG delivery events and through the use of weight scales.
Value(s) of monitored parameter	As per the adopted monitoring procedure, no LPG was consumed during the considered monitoring period. $FC_{LPG,y} = 0\ ton_{LPG}$
Monitoring equipment	*Specifications and calibration details for the installed weight scale for measurements of $FC_{LPG,y}$:*
Measuring/reading/recording frequency	Amount of LPG is measured upon the supply of cylinders of LPG with 45 kg capacity each.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	The amount of consumed LPG is cross-checked with internal records of cost expenditures for fuel LPG as per the internal financial/accounting management system of BATTRE. Monitoring equipment/instruments are calibrated and maintained as per instrument specifications and/or recommendations of manufacturer. Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed at Essencis Soluções Ambientais S.A. in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of project emissions (due to consumption of LPG by the project activity).
Additional comments	-

Data/Parameter	**$NCV_{LPG,y}$**
Unit	GJ/ton LPG
Description	Net calorific value of the fuel LPG
Measured/calculated/ Default	Default value is selected.

Source of data	National default value as per the Brazilian National Energetic Balance Report for year 2017 (Balanço Energético Nacional (BEN) – 2017) / Table VIII.9 – Specific Mass and Heating Values (Higher Heating Value). This official document was published by the public entity Empresas de Pesquisas Energéticas (EPE). While create and established in accordance with the Federal Law 10.847 of 15/03/2004, the EPE is a governmental entity that undertakes energy planning related investigation and research services. The BEN-2017 report is available online: http://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/Balanco-Energetico-Nacional-2017 Reported value in kcal/kg is converted into GJ/ton.
Value(s) of monitored parameter	46.5
Monitoring equipment	Not applicable.
Measuring/reading/recording frequency	In accordance with the PDD, as national default value is considered, an every-year monitoring frequency is thus applied.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of project emissions (due to consumption of LPG by the project activity).
Additional comments	-

Data/Parameter	**$EF_{CO2,LPG,y}$**
Unit	tCO_2/GJ LPG
Description	CO_2 emission factor of fuel LPG in year *y*
Measured/calculated/ Default	Default value is selected.
Source of data	Value is selected as per 2006 IPCC Guidelines on National GHG Inventories (applicable value at upper limit of uncertainty at 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy)).
Value(s) of monitored parameter	0.0656
Monitoring equipment	Not applicable.
Measuring/reading/recording frequency	In accordance with the PDD, as IPCC default value is considered, an every year monitoring frequency is thus applied.
Calculation method (if applicable)	Not applicable.

QA/QC procedures	Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of project emissions (due to consumption of LPG by the project activity)
Additional comments	-

Data/Parameter	**$EC_{PJ,captive,y}$**
Unit	MWh
Description	Quantity of electricity generated in captive diesel backup generator during the year *y*
Measured/calculated/ Default	Measured
Source of data	Measured as part of the operation of the project activity by applying appropriate monitoring instrument (one electricity meter with recordable electronic signal).
Value(s) of monitored parameter	Monthly records of electricity sourced by the backup captive diesel generator valid for the considered monitoring period:

Monitoring equipment	*Specifications and calibration details for the electricity meter used for measuring consumption of grid-sourced electricity:* - Manufacturer: KRON Instrumentos Elétricos Ltda. - Model: MULTIMEDIDOR MKM-D - Accuracy: ±0.2% - Serial Number (S/N): 672850 - Required calibration frequency (as specified by the monitoring methodology/ methodological tool): As per the PDD, all monitoring equipment must be calibrated periodically. The "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" establishes the following regarding maintenance and calibration for electricity meters: "*Monitoring equipment/instrument(s) will be subject to a regular maintenance and testing regime in accordance to appropriate national / international standards/requirements and/or best practice.*" - Calibration frequency (as per the recommendation of the meter manufacturer): it is important to note that the installed meter is approved/certified by INMETRO (The Brazilian national authority for metrology and standardization issues), and it is thus in conformance with INMETRO's requirements for maintenance and testing of electricity meters. According to the instruments manufacturer, the meter is to be calibrated every 5 years. A calibration frequency of 5 years is thus adopted. - Dates and validity of performed calibration events valid for the considered monitoring period: Calibration event dated 24/01/2016 valid until 23/01/2021, as indicated in the Calibration Certificate Number 141819-101, issued by KRON Instrumentos Elétricos Ltda. - Electricity meter with S/N 1995567: Calibration event dated 02/10/2018 valid until 01/10/2013, as indicated in the Calibration Certificate Number 199556780794/18, issued by CEIME Calibração e Comércio de Instrumentos Ltda.
Measuring/reading/recording frequency	Continuous measurements performed by installed electricity meters are recorded/reported every hour.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of the project emissions.
Additional comments	-

Data/Parameter	$FC_{Diesel,y}$
Unit	Liters
Description	Quantity of fuel diesel combusted by the captive off-grid electricity generator
Measured/calculated/ Default	Measured.
Source of data	Measured as part of the operation of the project activity by applying appropriate fuel meter.
Value(s) of monitored parameter	Monthly records of fuel diesel combusted by the backup captive diesel generator during the considered monitoring period:
Monitoring equipment	*Specifications and calibration details for the fuel meter used for measuring quantity of fuel diesel combusted by the captive off-grid electricity generator:* - Manufacturer: Macnaught Pty Ltd. - Model: DM100 - Serial number (S/N): n/a - Accuracy: ±1% - Required calibration frequency: As per the PDD, periodic calibration events are to be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Also as per the PDD, the instrument is to be subject to a regular maintenance and testing regime in accordance to appropriate national /international standards/requirements and/or best practice. For the particular case of the installed fuel meter (positioned in the fuel supply hose of a backup captive off-grid electricity generator (fuelled by diesel), there are no applicable national/international standards/requirements to be applied. By taking into account the design[7] and construction of the fuel meter (i.e. the fuel meter is tested as part of its manufacturing and delivery processes) and by also taking into account the not frequent use of the backup captive off-grid electricity generator (in which the fuel meter is installed) as part of the operation of the project activity, and also taking into account good practices for calibration of this type of instrument, it is defined that testing/calibration events are to be performed in the instrument with at least an every 3 years frequency. - Dates for performed testing/calibration events valid for the considered monitoring period:
Measuring/reading/recording frequency	Accumulated measurements records of consumption of diesel by the backup captive off-grid electricity generator (fuelled by diesel) are reported at with at least once a week, with values being aggregated on a monthly basis.

[7] The following is established in the instruction manual for the installed fuel meter model DM100:

> *"The Macnaught DM100 fuel meter has incorporated the oval rotor principal into its design. This has proven to be a highly reliable and highly accurate method of measuring flow, providing exceptional repeatability and high accuracy."*

The instruction manual and the specification sheet for the fuel meter model DM100, manufactured by Macnaught Pty Ltd. Are available online:
http://www.redashe.com/sites/default/files/Data_Sheets/Instruction-Manuals/Macnaught/Macnaught-DM100-Instruction-Manual.pdf
https://www.omniprocess.se/fileadmin/user_upload/omniprocess/pdf/datasheets/dm100.pdf

Calculation method (if applicable)	Not applicable.
QA/QC procedures	Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of project emissions
Additional comments	It is relevant to note that in the context of the determination of emission reductions achieved by the project activity during the considered monitoring period, monitoring records for the parameter $FC_{Diesel,y}$ are considered uniquely for the determination of the value for CO_2 emission factor for electricity consumed by the project activity through the application of guidance valid for Scenario C.III, Option B1 of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01). Project emissions due to consumption by the project activity of electricity generated by the installed backup captive off-grid electricity generator (fuelled by diesel) are primarily determined based on measurement records of the amount of electricity consumed by the project activity and generated by such backup electricity generator (monitoring parameter $EC_{PJ,captive,y}$). Therefore, monitoring records for the parameter $FC_{Diesel,y}$ are therefore not directly used for the determination of project emissions associated to consumption of fossil fuel diesel for generation of electricity that is consumed by the project activity.

Data/Parameter	**$NCV_{Diesel,y}$**
Unit	TJ/Gg
Description	Net calorific value of the fuel diesel in year *y*
Measured/calculated/ Default	Default
Source of data	IPCC default values (at upper limit of uncertainty at 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is selected.
Value(s) of monitored parameter	43.3
Monitoring equipment	Not applicable.
Measuring/reading/recording frequency	In accordance with the PDD, as IPCC default value is considered, an every year monitoring frequency is thus assumed as being applied.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).

Purpose of data/parameter	Calculation of project emissions
Additional comments	It is relevant to note that in the context of the determination of emission reductions achieved by the project activity during the considered monitoring period, monitoring records for the parameter $NCV_{Diesel,y}$ are considered uniquely for the determination of the value for CO_2 emission factor for electricity consumed by the project activity through the application of guidance valid for Scenario C.III, Option B1 of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01). Project emissions due to consumption by the project activity of electricity generated by the installed backup captive off-grid electricity generator (fuelled by diesel) are primarily determined on the application of both default and conservative value for emission factor for electricity generated by such backup captive power generation source + measurement records of the amount of electricity consumed by the project activity and generated by such backup electricity generator (monitoring parameter $EC_{PJ,captive,y}$). Therefore, the selected value for the parameter $NCV_{Diesel,y}$ is not used for the determination of project emissions associated to consumption of fossil fuel diesel for generation of electricity that is consumed by the project activity.

Data/Parameter	**$EF_{CO2,Diesel,y}$**
Unit	tCO_2/GJ
Description	CO_2 emission factor of fuel diesel in year y
Measured/calculated/ Default	Default
Source of data	IPCC default values (at upper limit of uncertainty at 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is selected.
Value(s) of monitored parameter	74,800
Monitoring equipment	Not applicable.
Measuring/reading/recording frequency	In accordance with the PDD, as IPCC default value is considered, an every year monitoring frequency is thus assumed as being applied.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of project emissions

Additional comments	It is relevant to note that in the context of the determination of emission reductions achieved by the project activity during the considered monitoring period, monitoring records for the parameter $EF_{CO2,Diesel,y}$ are considered uniquely for the determination of the value for CO_2 emission factor for electricity consumed by the project activity through the application of guidance valid for Scenario C.III, Option B1 of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01). Project emissions due to consumption by the project activity of electricity generated by the installed backup captive off-grid electricity generator (fuelled by diesel) are primarily determined on the application of both default and conservative value for emission factor for electricity generated by such backup captive power generation source + measurement records of the amount of electricity consumed by the project activity and generated by such backup electricity generator (monitoring parameter $EC_{PJ,captive,y}$). Therefore, the selected value for the parameter $EF_{CO2,Diesel,y}$ is therefore not used for the determination of project emissions associated to consumption of fossil fuel diesel for generation of electricity that is consumed by the project activity.

Data/Parameter	$\rho_{reg,y}$
Unit	-
Description	Fraction of LFG that is required to be flared due to a requirement in year *y*
Measured/calculated/ Default	Calculated
Source of data	The validity of the contractual requirement that defines the currently valid/applicable minimum level/share of methane required to be destroyed through combustion at the AMC landfill as part of the operation of this landfill (as a requirement previously established by the Administration of the Municipality of Salvador (municipal authority responsible for the public service of solid waste management for the city of Salvador)) will be annually confirmed. Such annual confirmation will be based on checking and assessment of information of new regulatory or non-regulatory requirements relating to LFG (new contractual requirements or new requirements to address safety and odour concerns) at municipal, regional and/or national level.
Value(s) of monitored parameter	5%
Monitoring equipment	Not applicable.
Measuring/reading/recording frequency	It will be annually confirmed whether the currently applicable value of 0.05 (5%) (that represents minimum level/share of methane currently required to be destroyed through combustion at the AMC landfill) will remain being valid.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	**$TDL_{grid,y}$**
Unit	-
Description	Average technical transmission and distribution losses for grid sourced electricity consumed by the project activity.
Measured/calculated/ Default	Default
Source of data	Applicable default value for consumption of grid-sourced electricity as per Option C.III of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) is selected.
Value(s) of monitored parameter	20%
Monitoring equipment	Not applicable.
Measuring/reading/recording frequency	In accordance with the PDD, default value as per Option C.III of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) is considered, an every year monitoring frequency is thus assumed as being applied.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of project emissions
Additional comments	-

Data/Parameter	**$TDL_{captive,y}$**
Unit	-
Description	Average technical transmission and distribution losses for electricity sourced by the captive electricity generator
Measured/calculated/ Default	Default
Source of data	Applicable default value as per Option C.III of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) is selected.
Value(s) of monitored parameter	20%

Monitoring equipment	Not applicable.
Measuring/reading/recording frequency	In accordance with the PDD, default value as per Option C.III of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) is considered, an every year monitoring frequency is thus assumed as being applied.
Calculation method (if applicable)	Not applicable.
QA/QC procedures	Procedures related to collection/gathering, recording, storing and reporting of monitoring data for the project activity are performed in accordance with detailed working instructions that are included in the company's ISO 9001 and 14001 certified quality management and control (QA/QC) and environmental management system (EMS).
Purpose of data/parameter	Calculation of project emissions
Additional comments	-

The following monitoring parameters (which are also included in the monitoring plan of the PDD) were not monitored as the methodological options for which they are applicable/valid were not selected as the monitoring or calculation approaches for the determination of baseline emissions achieved by the project activity during the considered monitoring period:

- Volumetric flow of LFG stream in time interval *t* on a dry basis for *j* (where *j* is the LFG delivery pipeline to each internal combustion gas engine and LFG delivery pipeline to each flare ($V_{t,db}$)
- Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis for *j* (where *j* is the LFG delivery pipeline to each internal combustion gas engine and LFG delivery pipeline to each flare ($V_{CH4,t,db}$)
- Mass flow of the LFG stream in time interval *t* on dry basis for *j* (where *j* is the LFG delivery pipeline to each internal combustion gas engine and LFG delivery pipeline to each flare ($M_{t,db}$)
- Mass flow of methane in the exhaust gas of the flare(s) on a dry basis at reference conditions in the time period *t* ($F_{CH4,EG,t}$)
- Saturation pressure of H_2O at temperature T_t in time interval *t* ($p_{H2O,t,Sat}$)

D.3. Implementation of sampling plan

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Not applicable.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

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Under conformance with provisions and calculation approaches of the PDD, baseline emissions (BE_y) for the project activity under its current design configuration are determined (in tCO_2e) for the considered monitoring period as follows:

$BE_y = BE_{CH4,y}$

Where:

$BE_{CH4,y}$ Baseline emissions of methane from the SWDS (in tCO_2e)[8]. As established by ACM0001 (version 15.0), the determination of $BE_{CH4,y}$ is based on the amount of methane that is actually captured and combusted (destroyed) by the project activity in its methane destruction devices + by taking into account the amount of methane that, in the absence of the project activity (baseline scenario), would be otherwise captured and destroyed in the landfill by the pre-project conventional LFG destruction system (conventional passive flares). In addition, the effect of methane oxidation (that, as per ACM0001 (version 15.0), is assumed as existing in the baseline scenario and not in the project scenario) is also taken into account. $BE_{CH4,y}$ is thus determined as follows:

$$BE_{CH4,y} = ((1 - OX_{top\_layer}) * F_{CH4,PJ,y} - F_{CH4,BL,y}) * GWP_{CH4}$$

Where:

OX_{top_layer} Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline scenario. OX_{top_layer} is ex-ante determined as 10%. Further details about the selection of the value for OX_{top_layer} is included in Section D.1 and in the PDD.

$GWP_{CH4,y}$ Global warming potential of CH_4. GWP_{CH4} is ex-ante determined as 25. Further details about the selection of the value for GWP_{CH4} is included in Section D.1 and in the PDD.

$F_{CH4,BL,y}$ Amount of methane in the LFG that would be flared in the baseline scenario (absence of project activity) (in tCH_4). As outlined in the PDD, $F_{CH4,BL,y}$ is calculated as follows:

$$F_{CH4,BL,y} = F_{CH4,BL,R,y} = \rho_{eg,y} * F_{CH4,PJ,capt,y}$$

Where:

$F_{CH4,BL,R,y}$ Amount of methane in the LFG which is flared in the baseline due to a requirement in year y (in tCH_4/yr).

$\rho_{eg,y}$ Fraction of LFG that is required to be flared due to a requirement in year *y.* Monitoring details for the parameter $\rho_{eg,y}$ are presented being in Section D.2

$F_{CH4,PJ,capt,y}$ Amount of methane collected by the project activity (in tCH_4). In the particular case of the determination of $F_{CH4,BL,y}$, the calculation parameter $F_{CH4,PJ,capt,y}$ is determined as the sum of the amount of methane that is sent to the project's methane destruction devices (i.e. set of 19 internal combustion gas engines and set of 4 high temperature enclosed flares) as follows:

$$F_{CH4,PJ,capt,y} = F_{CH4,sent,flare,y} + F_{CH4,EL,y}$$

Where:

$F_{CH4,EL,y}$ Amount of methane which is destroyed through combustion of collected LFG in the internal combustion gas engines (in tCH_4). Details for the determination of every-minute values for $F_{CH4,EL,y}$ are presented below (under "*Determination*

[8] SWDS = Solid Waste Disposal Site. For the case of the project activity, the SWDS is the AMC landfill.

of every-minute values for the calculation parameters $F_{CH4,sent\_flare,y}$ and $F_{CH4,EL,y}$"). It is relevant to note that for the particular context of determination of $F_{CH4,BL,y}$, the working hours and/or other status/conditions of which each device and status of the internal combustion gas engines are not accounted, thus potentially maximizing the determined value for $F_{CH4,BL,y}$ as a conservative approach.

$F_{CH4,sent,flare,y}$ Amount of methane in the LFG which is sent to the flares (in tCH_4). Details for the determination of every-minute values for $F_{CH4,sent\_flare,y}$ are presented below (under "*Determination of every-minute values for the calculation parameters $F_{CH4,sent\_flare,y}$ and $F_{CH4,EL,y}$"*).

For the considered monitoring period, the accumulated value for $F_{CH4,BL,y}$ is calculated as 1,556 tCH_4.

$F_{CH4,PJ,y}$ Amount of methane which is destroyed by the project activity through combustion of collected LFG in project's methane destruction devices (in tCH_4). $F_{CH4,PJ,y}$ is determined as follows:

$$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y}$$

Where:

$F_{CH4,EL,y}$ Amount of methane which is destroyed through combustion of collected LFG in the internal combustion gas engines (in tCH_4). Details for the determination of every-minute values for $F_{CH4,EL,y}$ for each individual internal combustion gas engine during the are presented below (under "*Determination of every-minute values for the calculation parameters $F_{CH4,sent\_flare,y}$ and $F_{CH4,EL,y}$"*).

$F_{CH4,flared,y}$ Amount of methane which is destroyed through combustion of collected LFG in the flares (in tCH_4). In accordance with calculation guidance included in the PDD and by following applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0), for each individual flare every-minute values for $F_{CH4,flared,y}$ are determined as the difference between the amount of methane supplied to the flare and residual methane emissions from combustion of LFG in the flare, as follows:

$$F_{CH4,flared,y} = F_{CH4,sent\_flare,y} - (PE_{flare,y} / GWP_{CH4})$$

Where:

$F_{CH4,sent\_flare,y}$ Amount of methane in the LFG which is sent to the flares. Details for the determination of every-minute values

for $F_{CH4,sent\_flare,y}$ for each individual flare are presented below (under "*Determination of every-minute values for the calculation parameters $F_{CH4,sent\_flare,y}$ and $F_{CH4,EL,y}$*").

$PE_{flare,y}$ Project emissions from flaring of the residual gas stream. Details for the determination of every-minute values for $PE_{flare,y}$ for each individual flare are presented below (under "*Determination of $PE_{flare,y}$*").

GWP_{CH4} Global warming potential of CH_4. GWP_{CH4} is ex-ante determined as 25. Further details about the selection of the value for GWP_{CH4} is included in Section D.1 and in the PDD.

Determination of $F_{CH4,sent\_flare,y}$ (calculation of sub-parameters $F_{CH4,sent\_flare,flare-1}$ and $F_{CH4,sent\_flare,flare-2}$):

By following calculation Option C of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0)[9], the mass flow of greenhouse gas *i* ($F_{i,t}$) (*i* = CH_4) for each installed flare is determined as follows:

$$F_{CH4,sent\_flare,y,flare-n} = V_{t,n,wb,flare-n} * v_{CH4,t,wb} * \rho_{CH4,n}$$

Where:

Sulfix "*Flare-n*": (flare in question: Flare 1 and Flare 2)

$V_{t,n,wb,flare-n}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a wet basis at normal conditions. While in the particular case of the project activity, during the considered monitoring period, measurements of volumetric flow of the gaseous stream (LFG) sent to each one of the 2 flares are not processed and recorded in Nm^3 of wet gas/h (normal conditions), values of $V_{t,wb,n,flare-n}$ (calculation sub-parameters $V_{t,wb,n,flare-1,}$ and $V_{t,wb,n,flare-2}$) valid for each minute encompassed by the monitoring period are thus calculated under conformance with related provisions of the PDD. The following equation is applied to convert every-minute records of measurements of volumetric flow of LFG sent to each one of the 2 flares from actual conditions to normalized (standard) conditions of temperature and pressure:

$$V_{t,wb,n,flare-n} = V_{t,wb,flare-n} * (T_n / T_t) * (P_t * P_n)$$

Where:

[9] For the considered monitoring period, Option C of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) (where the gaseous stream the tool shall be applied to is the stream of collected LFG that is sent to the flares and to the electricity generation facility)[9] is the selected option for determination of values of $F_{CH4,sent\_flare,y}$ valid for each one of the installed 2 flares and values of $F_{CH4,EL,y}$ valid for each one of the 19 internal combustion gas engines. This option represents one of the applicable calculation methods the PDD refers to.

$V_{t,wb,flare-n}$ Volumetric flow of the gaseous stream (LFG) to the flare *n* in time interval *t* on a wet basis at actual conditions. Every-minute measurement records of $V_{t,wb,flare-n}$ for each flare *n* (where *n* = 1 and 2) valid for the whole considered monitoring period are reported (in m³ wet gas/h) in the monthly emission reduction calculation spreadsheets which are enclosed to the Monitoring Report. Measurement records are presented under sub-parameters $V_{t,wb,flare-1}$ and $V_{t,wb,flare-2}$). Further monitoring details for the sub-parameters $V_{t,wb,flare-n}$ (*n* = 1 and 2) are included under details for the monitoring parameter $V_{t,wb,j,}$ in Section D.2.

T_t Temperature of the gaseous stream in time interval *t*. Every-minute values of $T_t$are reported (in Kelvin) in the monthly emission reduction calculation spreadsheets enclosed to the Monitoring Report. Further monitoring details about the sub-parameter T_t are included in Section D.2.

T_n Temperature at normal conditions. T_n is ex-ante determined as 273.15 Kelvin. Further details about the ex-ante determined parameter T_n are included in Section D.1 and in the PDD.

P_t Pressure of the gaseous stream in time interval *t*. Every-minute values of P_t are reported (in Pa) in the monthly emission reduction calculation spreadsheets enclosed to the Monitoring Report. Further monitoring details for P_t are included in Section D.2.

P_n Absolute pressure at normal conditions. P_n is ex-ante determined as 101,325 Pa. Further details about the ex-ante determined parameter P_n are included in Section D.1 and in the PDD.

All related calculation are presented in the monthly emission reduction calculation spreadsheets that are enclosed to the Monitoring Report.

$v_{CH4,t,wb}$ Volumetric fraction of CH_4 in the gaseous stream in time interval *t* on a wet basis. As per the applied monitoring procedure, every-minute values of the monitoring parameter $v_{CH4,t,wb}$ (in m³ of CH_4 / m³ of wet LFG) are reported in the monthly emission reduction calculation spreadsheet valid for the considered monitoring period (and enclosed to this Monitoring Report). Further monitoring details about the monitoring parameter $v_{CH4,t,wb}$ are included in Section D.2.

$\rho_{CH4,n}$ Density of CH_4 in the gaseous stream (LFG) at normal conditions. For the considered monitoring period, value of $\rho_{CH4,n}$ (in kg of CH_4 / m^3 of CH_4) is calculated and reported in the monthly emission reduction calculation spreadsheet valid for the considered monitoring period (and enclosed to this Monitoring Report) as follows:

$$\rho_{CH4,n} = (P_n * MM_i) / (R_u * T_n)$$

Where:

P_n Absolute pressure at normal conditions. P_n is ex-ante determined as 101,325 Pa. Further details about the ex-ante determined

parameter P_n are included in Section D.1 and in the PDD.

T_n Temperature at normal conditions. T_n is ex-ante determined as 273.15 Kelvin. Further details about the ex-ante determined parameter T_n are included in Section D.1 and in the PDD.

MM_i Molecular mass of greenhouse gas *i* (*i* = CH_4). MM_i (*i* = CH_4) is ex-ante determined as 16.04 kg/mol. Further details about the ex-ante determined parameter MM_i (*i* = CH_4) are presented in Section D.1 and in the PDD.

R_u Universal ideal gases constant. R_u is ex-ante determined as 8,314 Pa.m^3 /kmol.K. Further details about the ex-ante determined parameter R_u are presented in Section D.1 and in the PDD.

$\rho_{CH4,n}$ is calculated as 0.7156650 kgCH_4 / m^3CH_4 as reported in the monthly emission reduction calculation spreadsheet valid for the considered monitoring period.

While for each installed flare, the calculated every-minute values of $F_{i,t,flare-n}$ are equivalent to every-minute values for $F_{CH4,sent\_flare,y,flare-n}$, (where n = 1 and 2) the monthly emission reduction calculation spreadsheets valid for the considered monitoring period include the determination of every minute values of $F_{CH4,sent\_flare,y,flare-n}$ that is applicable for each one of the installed 2 high temperature enclosed flares for which collected LFG is sent for combustion.

Determination of $F_{CH4,EL,y}$ (calculation sub-parameters $F_{CH4,EL,y,engine-1}$, $F_{CH4,EL,y,engine-2}$, (…), $F_{CH4,EL,y,engine-19}$):

By also following calculation Option C of of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0), the mass flow of greenhouse gas *i* ($F_{i,t}$) (*i* = CH_4) to each individual internal combustion gas engine ($F_{CH4,EL,y,engine-1}$, $F_{CH4,EL,y,engine-2}$, (…), $F_{CH4,EL,y,\ engine-19}$) is determined as follows:

$$F_{CH4,EL,y,\ engine-n} = V_{t,wb,n,engine-n} * v_{CH4,t,wb} * \rho_{CH4,n}$$

Where:

n Number of the installed internal combustion gas engines *n* (additional/alternative methane destruction devices for the project activity) n = 1, 2, …, 19.

$V_{t,wb,n,engine-n}$ Volumetric flow of the gaseous stream (LFG) to the internal combustion gas engine *n* in time interval *t* on a wet basis at normal conditions. For the considered monitoring period, every-minute values of $V_{t,wb,n.engine-n}$ (calculation sub-parameters $V_{t,wb,n,engine-1}$, $V_{t,wb,n,engine-2}$, (…), $V_{t,wb,n,engine-19}$) are reported (in Nm^3 wet gas/h) in the monthly emission reduction calculation spreadsheets valid for the considered monitoring period (and enclosed to the Monitoring Report).

By taking into account that in the particular case of the project activity, during the considered monitoring period, measurements of volumetric flow of the gaseous stream (LFG) valid for each one of the 19 engines are already performed in Nm^3 wet

gas per hour (by considering standard temperature and pressure (STP) conditions), the following assumption is valid:

$V_{t,n,wb,engine-n}$ is equivalent to $V_{t,wb,engine-n}$

Where:

$V_{t,wb,engine-n}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a wet basis for engine *n* (where *n* = 1, 2, (…), 19), with monitoring details presented being in Section D.2

Note: in accordance with the PDD, since measurements of LFG flow to each one of the engines are automatically performed and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions), monitoring of "Pressure of the LFG stream in time interval t" (P_t) and "Temperature of the LFG stream in time interval *t*" (T_t) are not required to be considered for the determination of $V_{t,n,wb,engine-n}$.

$v_{CH4,t,wb}$ Volumetric fraction of CH_4 in the gaseous stream in time interval *t* on a wet basis. Further monitoring details about the monitoring parameter $v_{CH4,t,wb}$ are included above and in Section D.2.

$\rho_{CH4,n}$ Density of CH_4 in the gaseous stream (LFG) at normal conditions. $\rho_{CH4,n}$ is calculated as 0.7156650 $kgCH_4$ / m^3CH_4 as reported in the monthly emission reduction calculation spreadsheet valid for the considered monitoring period. Details about the determination of $\rho_{CH4,n}$ are presented above.

It is relevant to note that, as established in the PDD and presented in the monthly emission reduction calculation spreadsheets, for each one of the 19 internal combustion gas engine, the calculated amount of methane destroyed for minute *m* for a particular gas engine is directly accounted as 0 (zero) if the such methane destruction device is monitored as "not working" in such minute *m* (on the basis of available every-minute records for the parameter $Op_{j,h}$ (sub-parameters $Op_{engine-1,h}$, $Op_{engine-2,h}$, (…), $Op_{engine-19,h}$).

Determination of $PE_{flare,y}$:

$PE_{flare,y}$ is determined for each one of the installed flares ($PE_{flare,y,flare-1}$ and $PE_{flare,y,flare-2}$) by following the applicable stepwise guidance of the methodological tool "Project emissions from flaring" (version 2). For the considered monitoring period, every minute values for $PE_{flare,y,flare-1}$ and $PE_{flare,y,flare-2}$ are determined as a function of every-minute records of mass flow of methane sent to the flare in question (for each flare *n*, $F_{CH4,RG,m,flare-n} = F_{CH4,sent\_flare,y,flare-n}$, where *n* = 1 and 2) as well as based on calculated values for flare efficiency ($\eta_{flare,m} = \eta_{flare,calc,y}$) for each one of the flares as follows:

$$PE_{flare,y} = GWP_{CH4} * \sum_{m=1}^{525,600} F_{CH4,RG,m} * (1 - \eta_{flare,m}) * 10^{-3}$$

Where:

$F_{CH4,RG,m}$ Methane mass flow in the residual gas for the considered flare. For each minute *m* of the considered monitoring period and for each individual flare *n*, values for $F_{CH4,RG,m}$ are equal to every-minute reported measurement records of the calculation sub-parameter "Amount of methane in the LFG which is sent to the flares" ($F_{CH4,sent\_flare,y}$) that is valid for each individual flare (calculation sub-parameters $F_{CH4,sent\_flare,y,flare-1}$ and $F_{CH4,sent\_flare,y,flare-2}$)).

As per the applicable guidance of the methodological tool "Project emissions from flaring" and also as per the PDD, the methane mass flow in the residual gas (in a dry basis) for each minute *m* of the two time periods in year *y* during which the flare efficiency is measured shall be calculated by following the applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". Values for the parameter $F_{CH4,RG,t}$ valid for each flare (calculation sub-parameters $F_{CH4,RG,t,flare-1}$ and $F_{CH4,RG,t,flare-2}$) are thus calculated as follows:

$F_{CH4,RG,t,flare-n} = V_{t,db,n,flare-n} * v_{CH4,t,db} * \rho_{CH4,n}$

Where:

$\rho_{CH4,n}$ Density of greenhouse gas *i* (*i* = CH_4) in the gaseous stream (LFG) at normal conditions. Further details for the determination of $\rho_{CH4,n}$ are presented above under the sub-section "*Determination of every-minute values for the calculation parameter $F_{CH4,sent\_flare,y}$*".

$v_{CH4,t,db}$ Volumetric fraction of greenhouse gas *i* (*i* = CH_4) in the gaseous stream in a time interval *t* on a dry basis. The following is stated in footnote 3 of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream":

> "*(…) Flow measurement on a dry basis is not feasible at reasonable costs for a wet gaseous stream, so there will be no difference in the readings for volumetric fraction in wet basis analyzers and dry basis analyzers (…)*."

Thus, every-minute values of $v_{CH4,t,db}$ are regarded as equal to every-minute values of the monitoring parameter $v_{CH4,t,wb}$ (for which further details are presented above under the sub-section "*Determination of every-minute values for the calculation parameter $F_{CH4,sent\_flare,y}$*").

$V_{t,db,n,flare-n}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a dry basis for flare *n* (*n* = 1 and 2) at normal conditions. As per Option B of the applicable methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0), the volumetric flow of the gaseous stream on a dry basis for each flare at normal conditions (calculation sub-parameters $V_{t,db,n,flare-1}$ and $V_{t,db,n,flare-2}$) is determined by converting the measured volumetric flow from wet basis to dry basis as follows:

$V_{t,db,n,flare-n} = V_{t,wb,n,flare-n} / (1 + v_{H2O,t,db})$

Where:

$V_{t,wb,n,flare-n}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a wet basis at normal conditions. Further details of $V_{t,wb,n,flare-n}$ are presented above under the sub-section "*Determination of every-minute values for the calculation parameter $F_{CH4,sent\_flare,y}$*"

$v_{H2O,t,db}$ Volumetric fraction of H_2O in the gaseous stream in time interval *t* on a dry basis. As per applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", $v_{H2O,t,db}$ is calculated as follows:

$$v_{H2O,t,db} = \frac{m_{H2O,t,db} * MM_{t,db}}{MM_{H2O}}$$

Where:

MM_{H2O} Molecular mass of H_2O. MM_{H2O} is ex-ante determined as 18.0152 kg/kmol. Further details about the ex-ante determined parameter MM_{H2O} are included in Section D.1 and in the PDD.

$MM_{t,db}$ Molecular mass of the gaseous stream in time interval *t* on a dry basis. As per applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", $MM_{t,db}$ is calculated as follows:

$$MM_{t,db} = \sum_{k} (v_{k,t,db} * MM_{k})$$

Where:

k All gases, except H_2O, contained in the gaseous stream (e.g. N_2, CO_2, O_2, CO, H_2, CH_4, N_2O, NO, NO_2, SO_2, SF_6 and PFCs). See simplification below.

$V_{k,t,db}$ Volumetric fraction of gas *k* in the gaseous stream in time interval *t* on a dry basis. As per applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream":

> "*(…) The determination of the molecular mass of the gaseous stream ($MM_{t,db}$) requires measuring the volumetric fraction of all gases (k) in the gaseous stream. However, as a simplification, the volumetric fraction of only the gases k that are greenhouse gases and are considered in the emission reduction calculation in the underlying methodology must be monitored and the difference to 100% may be considered as pure nitrogen."*

ACM0001 (version 15.0) does not include any restriction to such simplification. Thus, only the volumetric fraction of gases that are greenhouse gases and are considered in related calculations (CH_4 in the particular case of the project activity) should be

measured and the difference to 100% is just considered as pure nitrogen. Further details for the determination of the volumetric fraction of CH_4 in the gaseous stream ($V_{k,t,db}$ = $v_{CH4,t,db}$) are presented above under the calculation parameter $v_{CH4,t,db.}$

MM_k Molecular mass of gas *k* (*k* = CH_4 and N_2). The molecular mass of CH_4 and N_2 are ex-ante determined as 16.04 and 28.01, respectively. Further details about the ex-ante determined values for MM_k are included in Section D.1 and in the PDD.

$m_{H2O,t,db}$ Absolute humidity in the gaseous stream in time interval *t* n a dry basis. As per Option 2 of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", by conservatively assuming that the gaseous stream is saturated ($m_{H2O,t,db}$ = $m_{H2O,t,db,Sat}$), $m_{H2O,t,db}$ is calculated as follows [10]:

$$m_{H2O,t,db,Sat} = \frac{p_{H2O,t,Sat} * MM_{H2O}}{(P_t - p_{H2O,t,Sat}) * MM_{t,db}}$$

Where:

MM_{H2O} Molecular mass of H_2O. MM_{H2O} is ex-ante determined as 18.0152 kg/kmol. Further details about the ex-ante determined values for MM_{H2O} are included in Section D.1 and in the PDD.

[10] It is important to note that the simplified calculation for the absolute humidity of the gaseous stream ($m_{H2O,t,db}$) presented in Option 2 of the methodological "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" shall be applied by assuming the gaseous stream is dry or saturated depending on which is the conservative situation. Footnote 4 of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" states the following:

> "*An assumption that the gaseous stream is saturated is conservative for the situation that the mass flow of greenhouse gas I is underestimated (applicable for calculating baseline emissions). Conversely, an assumption that the gas stream is dry is conservative for the situation that the greenhouse gas t is overestimated (applicable for calculating project emissions).*"

In this particular case, $m_{H2O,t,db}$ is calculated for the determination of the mass flow of methane in the residual gas on a dry basis during the time period t ($F_{CH4,RG,t}$). While $F_{CH4,RG,t}$ is used for the determination of the parameter $PE_{flare,y}$ (project emissions from flaring the residual gas), the assumption that the gaseous stream is dry (conservatively applicable for calculating project emissions) would not be conservative in this case as an overestimation of the amount of methane in the residual gas would actually increase the calculated efficiency of the flares, thus resulting in a reduction of $PE_{flare,y}$ and consequent increment of emission reductions.

P_t Absolute pressure of the gaseous stream in time interval *t*. Further monitoring details for P_t are included in Section D.2.

$MM_{t,db}$ Molecular mass of the gaseous stream in a time interval *t* on a dry basis. Further details for the determination of $MM_{t,db}$ are presented above.

$p_{H2O,t,Sat}$ Saturation pressure of H_2O at temperature T in time *t*, Further monitoring details about the monitoring parameter $p_{H2O,t,Sat}$ are included in Section D.2.

$\eta_{flare,m}$ Flare efficiency in minute m. For the considered monitoring period, $\eta_{flare,m}$ is determined based on the selection of default value as per Option A (application of default value for flare efficiency) of the methodological tool "Project emissions from flaring" from which the following related guidance of the PDD is applied:

> *"(…)*
> *Option A: Application of default value:*
> *For each one of the high temperature enclosed flares installed as part of the project activity, the flare efficiency for each minute m ($\eta_{flare,m}$) is 90% when the following two operational conditions/requirements are simultaneously met (in order to demonstrate that the flare is operating as per the recommendations and requirements set by the equipment manufacturer for the minute m in question):*
>
> *(1) The temperature of the exhaust gases of the flare (monitoring parameter $T_{EG.m}$) and the flow rate of LFG to the flare (monitoring parameter $F_{RG,m}$) is within the manufacturer's specification/requirements for the flare (monitoring parameter $SPEC_{flare}$) in minute m*
> *;*
> *(2) Flame is detected in the flare in minute m (monitoring parameter $Flame_m$).*
>
> *If for the minute m, conditions (1) and/or (2) are not met, $\eta_{flare,m}$ is set as 0% for the minute in question*
> *(…)"*

In summary, for every minute *m* within the considered monitoring period, $\eta_{flare,m}$ = 0.90 (90%) (upon demonstration of full compliance with operational and maintenance requirements for the flare) or 0% (in case full compliance with operational and maintenance requirements for the flare in question is not demonstrated). As defined by the *ex-ante* determined parameter "Manufacturer's flare specifications for temperature, flow rate and maintenance schedule interval" ($SPEC_{flare}$), compliance with operational temperature range, flow rate range and required maintenance schedule interval is considered for the determination of the selected default value of $\eta_{flare,m}$ for the determination of $F_{CH4,flared,y}$ and its application along every minute *m* the considered monitoring period.

The selection and application of default values for $\eta_{flare,m}$ (90% or 0%) for each minute *m* of the considered monitoring period is presented in the monthly emission reduction spreadsheets.

Data records for the monitoring parameter "Flame detection of flare in the minute *m*" ($Flame_m$) are also considered for the determination and application of the values of $\eta_{flare,m}$ for the determination of values of $F_{CH4,flared,y}$ along the considered monitoring period. For each installed flare, the time the flare has operated is determined by monitoring the flame combustion status/condition by using an UV flame detector (of which status signal (flame status "*on*" or "*off*") is continuously recorded and reported). Moreover, the monitoring requirements related to operational requirements/conditions for the flare (as established in the specifications for operational conditions defined by the flares' designer and manufacturer as per the ex-ante determined parameter $SPEC_{flare}$ (min. and max. flow of LFG to the flares + temperature of exhaust gas of the flares + meeting of maintenance requirements)) are also effectively considered in the context of the application of the default values for $\eta_{flare,m}$ along the considered monitoring period. As outlined in the monthly emission reduction spreadsheets, for each minute *m* of the considered monitoring period in which the flare has combusted LFG by not operating in accordance with all the operational criteria as established by the ex-ante estimated parameter $SPEC_{flare}$ (in terms of LFG flow, temperature of exhaust gas or maintenance practice), the 0% value is directly applied for $\eta_{flare,m}$ and no destruction of methane is therefore accounted for the flare in question during the minute *m* as part of the calculation value of $F_{CH4,flared,y}$.

For the considered monitoring period, the accumulated value for $F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y}$ is calculated as 21,021 tCH_4.

For the considered monitoring period, baseline emissions of methane from the SWDS ($BE_y = BE_{CH4,y}$) are calculated as 680,434 tCO_2e. The summarized emission reduction calculation spreadsheets (that are enclosed to this Monitoring Report) summarizes the determination of $BE_y = BE_{CH4,y}$ for the considered monitoring period.

E.2. Calculation of project emissions or actual net removals

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Under conformance with provisions and calculation approaches of the PDD, project emissions (PE_y) for the considered monitoring period are determined (in tCO_2e) as follows:

$PE_y = PE_{EC,y} + PE_{FC,y}$

Where:

$PE_{EC,y}$	Project emissions from consumption of electricity due to the project activity (tCO_2/yr)
$PE_{FC,y}$	Project emissions from consumption of fossil fuels due to the project activity (for purpose other than electricity generation) (tCO_2/yr).

Project emissions due to the consumption of electricity by the project activity ($PE_{EC,y}$):

During the considered monitoring period the project activity consumed mostly electricity which is regarded as grid-sourced electricity[11] with minor amount of electricity sourced by backup captive off-grid electricity generator being also consumed.

While grid-sourced electricity and electricity generated by the backup captive off-grid electricity generator (fuelled by diesel) represent the sources of electricity consumed by the project activity, $PE_{EC,y}$ is thus calculated as follows:

$PE_{EC,y} = PE_{EC,grid,y} + PE_{EC,captive,y}$

Where:

$PE_{EC,grid,y}$ Project emissions from consumption of grid-sourced electricity by the project activity

$PE_{EC,captive,y}$ Project emissions from consumption of electricity generated by a captive off-grid electricity generator fuelled by fossil fuel (diesel)

For the considered monitoring period, $PE_{EC,grid,y}$ and $PE_{EC,captive,y}$ are determined as follows:

(i) Project emissions due to the consumption of grid-sourced electricity by the project activity ($PE_{EC,grid,y}$):

By directly applying applicable guidance of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01), project emissions due to the consumption of grid-sourced electricity by the project activity ($PE_{EC,grid,y}$) are calculated as follows:

$PE_{EC,grid,y} = EC_{PJ,grid,y} * EF_{EL,grid,y} * (1 + TDL_{grid,y})$

Where:

$TDL_{grid,y}$ Average technical transmission and distribution losses for grid-sourced electricity consumed by the project activity in year *y.* As per applied monitoring procedure, the value for $TDL_{grid,y}$ is determined 20%. Further details about the ex-post determination of the value for $TDL_{grid,y}$ are included in Section D.2.

$EC_{PJ,grid,y}$ Quantity of grid sourced electricity consumed by the project activity. As per the applied monitoring procedure, monthly records of consumption of electricity regarded as supplied by the grid valid for the considered monitoring period are summarized below:

Additional monitoring details about the monitoring parameter $EC_{PJ,grid,y}$ are included in Section D.2.

[11] Under conformance with project design description outlined in the PDD, during the considered monitoring period, the project activity consumed mostly electricity sourced by the grid-connected electricity generation infrastructure fuelled by LFG (of which the set of 19 internal combustion engines (project's methane destruction devices) represents major components) and grid-sourced electricity (during periods when the grid-connected electricity generation was not under operation, but supply of grid-sourced electricity was normal). As defined in the PDD, since emission reductions due to displacement of a more-GHG-intensive service (due to generation of electricity using collected LFG as fuel) are not eligible and/or claimable for the project activity, all consumption by the project activity of electricity generated by the grid-connected electricity generation infrastructure fuelled by LFG located within the geographical limits of the AMC landfill is to be regarded and accounted as consumption of grid-sourced electricity (with related project emissions being determined ex-post) as a conservative approach.

$EF_{EL,grid,y}$ Emission factor for grid sourced electricity in year *y.* By taking into account the source of electricity to be consumed by the project activity (gird-sourced electricity and electricity sourced by backup captive off-grid electricity generator (fuelled by diesel)), the PDD defines that the project activity fits under Scenario C with Case C.III of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) and the following generic approach is thus defined as applicable for the determination of $EF_{EL,grid}$:

> *"Where case C.III has been identified, as a conservative simple approach, the emission factor for electricity generation should be the more conservative value between the emission factor determined as per guidance for scenario A and B respectively. This means that the more conservative value should be chosen between a) the result of applying either option A1 or A2 and b) the result of applying either option B1 or B2."*

The above-quoted options of the methodological tool are thus all applied for the determination of $EF_{EL,grid,y}$ (with the most conservative (higher) value being chosen) as follows:

Option A1: Under Option A1, $EF_{EL,grid,y}$ is selected as the combined margin (CM) emission factor ($EF_{grid,CM,y}$) for year 2012 which is calculated as per applicable guidance of the methodological tool "Tool to calculate the emission factor for an electricity system" (version 04.0) as the weighted average of the operating margin and build margin emission factors. To weight these two factors, the default values applicable to both weighting factor as valid for the 2nd crediting period are applied. The combined margin emission factor is thus obtained as follows:

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

Where:

w_{OM} Weighting of operating margin emissions factor. w_{OM} is ex-ante selected as 25%. Further details about the ex-ante selected parameter w_{OM} are included in Section D.1 and in the PDD.

w_{BM} Weighting of operating margin emissions factor. w_{BM} is ex-ante selected as 75%. Further details about the ex-ante selected parameter w_{BM} are included in Section D.1 and in the PDD.

$EF_{grid,OM}$ Operating margin CO_2 emission factor in year *y*. As per the applied monitoring procedure, the selected values for the monitoring parameter $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$ (0.6228 tCO_2/MWh for year 2012) represent to the official average values for years (vintages) 2012 as calculated and made public available by the DNA of

Brazil. Further details about the monitoring parameter $EF_{grid,OM}$ are included in Section D.2.

$EF_{grid,BM}$ Build margin CO_2 emission factor in year *y*. $EF_{grid,BM}$ is ex-ante determined as 0.2963 tCO_2/MWh. Further details about the ex-ante determined parameter $EF_{grid,BM}$ are included in Section D.1 and in the PDD.

As presented in the summarized emission reduction calculation spreadsheet which is also enclosed to this Monitoring Report, $EF_{grid,CM,y}$ is calculated as 0.3065 tCO_2/MWh.

Option A2: Under Option A2, $EF_{EL,grid,y}$ is directly determined as 1.3 tCO_2/MWh (applicable conservative default value of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"). Further details for the ex-ante selected value of $EF_{EL,grid,y}$ under Option A2 is made available in Section D.1 and in the PDD.

Option B1: Under Option B1, $EF_{EL,grid,y}$ is calculated based on (i) the CO_2 emissions for the fossil fuel diesel consumed by the installed backup captive off-grid electricity generator, (ii) the ration between the amount of fuel consumed by such generator and amount of generated electricity during the considered monitoring period (with the fuel net caloric value also being considered) as follows:

$$EF_{EL,grid,y} = \frac{FC_{Diesel,t} \times NCV_{Diesel} \times EF_{CO2,Diesel}}{EG_{Diesel\text{-}generator}}$$

Where:

$FC_{Diesel,y}$ Amount of fossil fuel diesel consumed by the installed backup captive off-grid electricity generator during the considered monitoring period. As per applied monitoring procedure, $FC_{Diesel,t}$ is determined 40,276 liters (equivalent to 1,680 kg, by taking into account the density of fuel diesel of 840 kg/m^3 (as established by Brazilian Energetic Balance Report, year 2012 (Table VIII.9 – Specific Mass and Heating Values) available at https://ben.epe.gov.br/BENRelatorioFinal.aspx?anoColeta=2017&anoFimColeta=2012)) as per monitoring records of the parameter monitored ex-post $FC_{diesel,y}$, of which further details are included in Section D.2.

NCV_{Diesel} Net calorific value for fossil fuel diesel. As per applied monitoring procedure, $NCV_{Diesel,y}$ is determined as 43.3 TJ/Gg. Further details

about the ex-post determination of the value for $NCV_{diesel,t}$ are included in Section D.2.

$EF_{CO2,diesel}$ CO_2 emission factor of fuel diesel. As per applied monitoring procedure, $EF_{CO2,diesel,y}$ is determined as 74,800 $kgCO_2/TJ$. Further details about the ex-post determination of the value for $EF_{CO2,diesel,t}$ are included in Section D.2.

$EG_{Diesel\text{-}generator}$ Amount of electricity generated by the installed backup captive off-grid electricity generator during the considered monitoring period. As per applied monitoring procedure, $EG_{Diesel\text{-}generator,y}$ is determined as 117,665 MWh Further details about the ex-post determination of the value for $EG_{Diesel\text{-}generator,y}$ are included in Section D.2.

As calculated in the summarized emission reduction calculation spreadsheet that is enclosed to this Monitoring Report, $EF_{ELgrid,y}$ as per Option B.1 is determined as being 0.7749 tCO_2/MWh.

Option B2: Under Option B2, $EF_{EL,grid,y}$ is also directly determined as 1.3 tCO_2/MWh (applicable conservative default value of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"). Selected value represents the ex-ante determined value for parameter CO_2 emission factor for electricity sourced by the captive off-grid electricity generator ($EF_{EL,captive,y}$). Further details for the ex-ante selected value of $EF_{EL,captive,y}$ is made available in Section D.1 and in the PDD.

While the most conservative value (highest value) among Options A1, A2, B1 and B2 is confirmed as being 1.3 tCO_2/MWh, this value is thus applied in the particular context of the determination of $EF_{EL,grid,y}$.

For the considered monitoring period, the accumulated value of $PE_{EC,grid,y}$ is calculated as 1.556 MWh.

The summarized emission reduction calculation spreadsheet (that is enclosed to this Monitoring Report) includes all calculations related to the determination of the accumulated value of $PE_{EC,grid,y}$ for the considered monitoring period.

(ii) <u>Project emissions due to the consumption of electricity sourced by backup captive off-grid electricity generator (fuelled by diesel) ($PE_{EC,captive,y}$):</u>

By directly applying applicable guidance of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01), project emissions due to the consumption by the project activity of electricity generated by the installed backup captive off-grid electricity generator (fuelled by diesel) ($PE_{EC,captive,y}$) are calculated as follows:

$$PE_{EC,captive,y} = EC_{PJ,captive} * EF_{EL,captive} * (1 + TDL_{captive,y})$$

Where:

$TDL_{captive,y}$ Average technical transmission and distribution losses for electricity sourced by the captive electricity generator. As per applied monitoring procedure, the value for $TDL_{captive,y}$ is determined 20%. Further details about the ex-post determination of the value for $TDL_{captive,y}$ are included in Section D.2.

$EC_{PJ,captive,y}$ Amount of electricity sourced by the backup captive off-grid electricity generator (fuelled by diesel) and consumed by the project activity. As per the applied monitoring procedure, monthly records of consumption by the project activity of electricity sourced by the backup captive off-grid electricity generator (fuelled by diesel) during the considered monitoring period are summarized below:

$EF_{EL,captive,y}$ CO_2 emission factor for electricity sourced by the captive off-grid electricity generator in year *y.* Like in the case of $EF_{EL,grid,y}$, the PDD defines the following approach of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) regarding the determination of $EF_{EL,captive,y}$:

> *"Where case C.III has been identified, as a conservative simple approach, the emission factor for electricity generation should be the more conservative value between the emission factor determined as per guidance for scenario A and B respectively. This means that the more conservative value should be chosen between a) the result of applying either option A1 or A2 and b) the result of applying either option B1 or B2."*

While in the particular context of the determination of $EF_{EL,grid,y}$, as presented above, the most conservative value (highest value) among Options A1, A2, B1 and B2 is confirmed as being 1.3 tCO_2/MWh, this value is thus applied also applied in the particular context of the determination of $EF_{EL,captive,y}$. Selected value in fact represents the ex-ante determined value for parameter CO_2 emission factor for electricity sourced by the captive off-grid electricity generator ($EF_{EL,captive,y}$) as outlined in the PDD.

For the considered monitoring period, the accumulated value for the $PE_{EC,captive,y}$ is thus calculated as follows:

$PE_{EC,captive,y}$ = 0.161 MWh * 1.3 tCO_2/MWh = 1 tCO_2 (rounded value)

The summarized emission reduction calculation spreadsheet (that is enclosed to this Monitoring Report) includes all calculations related to the determination of the accumulated value of $PE_{EC,captive,y}$ for the considered monitoring period.

Total project emissions due to the consumption of electricity by the project activity ($PE_{EC,y}$) for the considered monitoring period are calculated as $PE_{EC,grid,y}$ + $PE_{EC,captive,y}$ and represents 3,478 tCO_2 (rounded value).

Project emissions from consumption of fossil fuels due to the project activity (for purpose other than electricity generation) ($PE_{FC,y}$):

During the considered monitoring period relatively low amount of Liquefied Petroleum Gas (LPG) was consumed for igniting project's high temperature enclosed flares. By following related provisions in the PDD, project emissions associated with consumption of fossil fuel (for purposes other than electricity generation) ($PE_{EC,y}$) are determined as follows:

$PE_{FC,y} = PE_{LPG,y}$

Where:

$PE_{LPG,y}$ Project emissions due to the consumption of Liquefied Petroleum Gas by the project activity in year y (in tCO_2/year). By directly applying valid guidance of the methodological tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) and under conformance with the PDD, $PE_{LPG,y}$ is determined as follows:

$$PE_{LPG,y} = FC_{LPG,y} * COEF_{LPG,y}$$

Where:

$FC_{LPG,y}$ Quantity of LPG consumed by the project activity in year *y*. As per the adopted monitoring procedure, during the considered monitoring $FC_{LPG,y}$ is determined as 0 kg (0 ton) of LPG. Additional monitoring details for the monitoring parameter $FC_{LPG,y}$ are included in Section D.2.

$COEF_{LPG,y}$ CO_2 emission coefficient for LPG. As established in the PDD, $COEF_{LPG,y}$ is determined by following applicable guidance of Option B of the methodological tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) as follows:

$$COEF_{LPG,y} = NCV_{LPG,y} * EF_{CO2,LPG,y}$$

Where:

$NCV_{LPG,y}$ Net calorific value of the fuel LPG (in GJ/ton LPG)

$EF_{CO2,LPG,y}$ CO_2 emission factor of fuel LPG (in energy basis). As per the applied monitoring procedure, $EF_{CO2,LPG,y}$ is determined as 0.0656 tCO_2/GJ. Further details about the determination of the monitoring parameter $EF_{CO2,LPG,y}$ are included in Section D.2.

$NCV_{LPG,y}$ Net calorific value of the fuel LPG. As per the applied monitoring procedure, $NCV_{LPG,y}$ is determined as 49.2 GJ/ton for the considered monitoring period. Further details about the monitoring parameter $NCV_{LPG,y}$ are included in Section D.2

Thus, $COEF_{LPG,y} = 0.0656\ tCO_2/GJ * 46.5\ GJ/ton = 3.05\ tCO_2/ton$

In summary, $PE_{LPG,y}$ is calculated as follows:

$PE_{LPG,y} = 0$ ton LPG * 3.05 tCO_2/ton LPG = 0 tCO_2

Project emissions due to the consumption of LPG are thus determined as 0 tCO_2 (rounded value).

The summarized emission reduction calculation spreadsheet (that is enclosed to this Monitoring Report) includes all calculations related to the determination of the accumulated value of $PE_{LPG,y}$ for the considered monitoring period.

In summary, total project emissions (PE_y) for the considered monitoring period are calculated as $PE_{EC,y} + PE_{LPG,y}$ and represents 2,136 tCO_2 (rounded value).

E.3. Calculation of leakage emissions

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Not applicable.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	680,434	2,136	-	678,298	-	678,298

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante (t CO_2e)
678,298	833,251

E.6. Remarks on increase in achieved emission reductions

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Achieved emission reductions by the project activity during the considered monitoring period are about ~22% lower than the calculated equivalent value of ex-ante estimation of emission reductions valid for the same period (encompassing 60 days within years 2011 and 2012) as per the PDD. The following aspect justifies and explains the relative difference between the value for ex-ante estimation of emission reductions as per the PDD (calculated as valid/equivalent for the considered monitoring period) and emission reductions actually achieved by the project activity during the considered monitoring period:

<u>Aspect/condition which represents a decrease factor of reported emission reductions for the considered monitoring period when compared against the ex-ante estimation of emission reduction equivalent for the same period in the PDD:</u>

- *Uncertainties associated with the application of First Order Decay (FOD) multi-phased model for estimating the emission reductions in the PDD:*
  As outlined in the PDD, like other similar CDM project activities encompassing LFG collection and destruction/utilization, the amount of methane to be generated by decomposition of MSW disposed at the AMC landfill and collected by the project activity was derived by applying the First Order Decay (FOD) model as per the methodological tool "Emissions from Solid Waste Disposal Sites" (version 08.0) in the context of the determination of ex-ante estimated emission reductions to be achieved during the 2nd 7-year renewable crediting period. By taking in account all potential uncertainties associated with the application of such multi-phased decay model, it is reasonable to assume that, in the particular case of the project activity during the considered monitoring period, the application of this model somehow overestimated the amount of LFG to be actually

generated and collected by the project activity. In this particular context, it is crucial to note that, while the PDD assumes a LFG collection efficiency of 92.80% (ex-ante determined parameter “Efficiency of the LFG capture system that will be installed in the project activity” (η_{PJ})) in the context of the ex-ante estimates of emission reductions, as outlined in Section A.1 and B.2, during the considered monitoring period there were relevant number of LFG collection wells and conventional LFG venting/combustion drains that were not connected to project activity, thus negatively affecting the collection efficiency of LFG generated in the site during the considered period. Besides of minor uncertainty aspects, this particular aspect represents a relevant negative impact over emission reductions achieved during the period (when compared to estimates in the PDD).

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Document information

Version	*Date*	*Description*
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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