




**Validation report form for renewal of CDM programme of activities period
(Version 02.0)**

BASIC INFORMATION

Title and UNFCCC reference number of the programme of activities (PoA)	Caixa Econômica Federal Solid Waste Management and Carbon Finance Project PoA reference number 6573
Number and duration of the next period	2 nd period length – 7 years
Version number of the validation report	01
Completion date of the validation report	10/01/2020
Version number of PoA-DD to which this report applies	3.0
Coordinating/managing entity (CME)	Caixa Econômica Federal
Host Parties	Brazil
Applied methodologies and standardized baselines	ACM0001: Flaring or use of landfill gas --- Version 19.0.
Mandatory sectoral scopes	13: Waste handling and disposal
Conditional sectoral scopes, if applicable	1: Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions or GHG removals by sinks in the next programme of activities period	Not Applicable ¹
Name and UNFCCC reference number of the DOE	Name: KBS Certification Services Pvt. Ltd. UNFCCC reference number: E-0051
Name, position and signature of the approver of the validation report	 Kaushal Goyal Managing Director KBS Certification Services Pvt. Ltd.

¹ This is not applicable since the estimated annual average of GHG emission reductions would be defined at specific CPA level.

SECTION A. Executive summary**Purpose and general description**

The objective of the programme of activity “Caixa Econômica Federal Solid Waste Management and Carbon Finance Project” in Brazil is to capture landfill gas (LFG) generated through the decomposition of the organic matter of municipal solid waste disposed at the participating landfill sites (CPA sites) and its flaring and/or to utilise the LFG for electricity generation and/or to supply consumers (through a natural gas distribution network, dedicated pipelines and/or using trucks).

Scope of validation

The purpose of a validation is to have an independent third party assess of the updated programme of activities design document to confirm that the original project baseline is still valid or has been updated taking in account of new data where applicable. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC criteria are validated in order to confirm the correctness of the application of the approved baseline methodologies for the determination of the continued validity of the baseline or its update, and estimation of the emission reductions for the applicable crediting period.

The validation scope is defined as an independent and objective review of the updated programme of activities design document (PoA-DD). The updated PoA-DD is reviewed against Kyoto Protocol requirements, UNFCCC rules and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology ACM0001 (version 19.0).

Validation process

This report summarizes the findings from the validation of the updated PoA-DD of the PoA, performed on the basis of UNFCCC criteria for CDM, as well as criteria given by the CDM Validation and Verification Standard for programmes of activities, CDM Project Cycle Procedure for programmes of activities and CDM Project Standard for programmes of activities and included an assessment of: (a) The impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant guidance from the Board with regard to renewal of the crediting period at the time of requesting renewal of crediting period; (b) The correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions from the applicable crediting period. This validation opinion is also to be seen in conjunction with the validation report at the time of requesting registration for the first crediting period. The Validation Opinion is not meant to provide any consultancy towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

Conclusion

Caixa Econômica Federal has commissioned KBS Certification Services Pvt. Ltd. to perform the validation for renewal of the crediting period of the registered project activity “Caixa Econômica Federal Solid Waste Management and Carbon Finance Project” in Brazil (hereafter called “the project”). In conclusion, it is KBS's opinion that the project meets all the relevant requirements for the renewal of the crediting period.

SECTION B. Validation team, technical reviewer and approver**B.1. Validation team member**

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interview(s)	Validation findings
1.	Team Leader/ Technical Expert (1.2, 13.1) Local Expert	EI	Leiroz	Andrea	Central Office	✓		✓	✓
2.	Validator	IR	Dey	Deboshmita	Central Office	✓			
3.	Validator	IR	Sharma	Shikha	Central Office	✓			

B.2. Technical reviewer and approver of the validation report for renewal of PoA period

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical Reviewer (TA 1.2, 13.1)	IR	Badaya	Rohit	Central Office
2.	Manager Technical & Certification	IR	Sharma	Chetan Swaroop	Central Office
3.	Authorizer	IR	Goyal	Kaushal	Central Office

SECTION C. Means of validation**C.1. Desk/document review**

The report is based on the assessment of the programme of activities design document version 1.1 and subsequent versions /2/, application of standard auditing techniques including but not limited to desk review, follow up actions (e.g., electronic (telephone or e-mail) interviews) and also the review of the applicable approved methodological and relevant tools, guidance and CDM decisions.

All the documents used for arriving validation conclusion are listed in Appendix 03 and referenced accordingly in validation report.

C.2. On-site inspection

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

A complete desk review of the submitted PoA-DD (version 1.1) and supportive evidences have been checked by the Validation Team.

In addition, audit team has conducted calls/interviews (telephonic) with CME on different topics as mentioned under section C.3 of this report.

Based on the calls/interviews, PoA-DD review, as the review of UNFCCC procedures and guidelines, KBS Validation team has proceeded to skip the site visit. As per para 184 of CDM

Validation and Verification Standard for programmes of activities version 02.0 /3/, Validation team has used the following alternative means for its assessment and to justify that they are sufficient for the purpose of validation.

- By review of PoA-DD;
- By taking follow up actions by conducted interview with CME, to gather information about knowledge of project design, current situation via telephonic call and e-mail communication. Cross-checked evaluation under the scope of all information and references provided in PoA-DD. Details of interviewees, topics covered and additional information presented in the below section “C.3 – Interviews”.

Validation team has also checked the site visit requirements mentioned in the VVS for PoA version 02.0 /3/ and concluded that no site visit is required. The justification for the site visit requirements of VVS PoA version 02.0 /3/ have been mentioned below.

VVS PoA version 02.0 requirements	Validation team justification
<p>Para 29 (b)</p> <p>(b) Follow-up actions (e.g. on-site inspection and telephone or e-mail interviews), including:</p> <p>(i) Interviews with relevant stakeholders in the host country, such as personnel with knowledge of the PoA design and implementation;</p> <p>(ii) Cross checks between the information provided by interviewed personnel (i.e. by checking sources or other interviews) to ensure that no relevant information has been omitted;</p>	<p>Validation team has done the follow-up actions by:</p> <ol style="list-style-type: none"> 1. telephonic call and e-mail conversations of CME. 2. Cross checks between information provided by interviewed personnel (i.e. by checking sources or other interviews) to ensure that no relevant information has been omitted.
<p>Para 183</p> <p>It is mandatory for the DOE to conduct an on-site inspection at validation for the proposed CPA if:</p> <p>(a) Its estimated annual average of GHG emission reductions or net anthropogenic GHG removals is more than 100,000 t CO₂ eq; or</p> <p>(b) There is pre-project information that is relevant to the requirements for inclusion of the CPA and may not be traceable after the inclusion.</p>	<p>The validation team has not considered the site visit as mandatory due to the following reasons which are in line with the VVS PoA version 02.0 requirements.</p> <p>For the PoA to be renewed, this is not applicable as the estimated annual average of GHG emission reductions would be defined at specific CPA level.</p> <p>Also there is no pre-project information that is relevant to the requirements for renewal of the PoA and may not be traceable after the renewal.</p> <p>Hence for the proposed PoA, it is not mandatory to conduct the site visit.</p>

C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Toffanello	Naya	Caixa Econômica Federal	02/12/2019	<p>Telephone interview encompassing the following topics:</p> <ul style="list-style-type: none"> • General description • Technologies / measures • Methodology applicability • Monitoring plan • Estimation of emission reductions • Eligibility criteria for inclusion of CPAs 	Andrea Leiroz
2.	Nagai	Karen	EQAO			

C.4. Sampling approach

Not applicable for this programme of activity.

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

Area of validation findings	No. of CL	No. of CAR	No. of FAR
Programme of activities			
Compliance with PoA-DD form	-	01	-
Programme of activities period	-	-	-
Coordinating/managing entity and the project participants	-	-	-
Post-registration changes	-	-	-
Generic component project activities			
Application and selection of methodologies and standardized baselines	-	01	-
Validity of original baseline or its update	-	01	-
Estimated emission reductions or net anthropogenic removals	01	05	-
Validity of monitoring plan	01	04	-
Eligibility criteria for inclusion of CPAs	-	01	-
Others (please specify)	-	-	-
Total	02	13	-

SECTION D. Validation findings**D.1. Programme of activities****D.1.1. Compliance with PoA-DD form**

Means of validation	PoA-DD applies the applicable CDM-PoA-DD-FORM: Programme of activities design document form version 9.0 /6/. KBS verified that the renewal crediting period, information transferred to the later valid version of the PoA-DD form is materially the same as that in the registered PoA-DD /1/.
Findings	CAR-01 was raised and successfully closed. The findings are discussed in Appendix 04 of the validation report.
Conclusion	Validation team confirms that final PoA-DD is completed using the valid version of the applicable CDM-PoA-DD-FORM: Programme of activities design document form version 9.0 /6/ in compliance with para 390 (a) (i) of VVS for PoA version 02. All the information has been correctly transferred from registered PoA-DD to the current PoA-DD which is filled in the latest PoA-DD form available in UNFCCC website. Validation team confirms that the transfer of information from the old form to the new form is correct and materially the same as the information in the registered PoA-DD in compliance with para 390 (a) (ii) of VVS for PoA version 02. PoA-DD is in compliance with the instruction provided in the template.

D.1.2. Programme of activities period

Means of validation	As per the Para.122/PS-PoA, the validation team assessed the crediting period of the generic CPA selection in the PoA-DD. The type of crediting period is renewable and the length of the crediting period is 7 years (05/10/2019 – 04/10/2026).
Findings	N/A
Conclusion	The crediting period of the generic CPA and its length has been correctly and transparently stated in the PoA-DD in accordance with Para.122/PS-PoA.

D.1.3. Coordinating/managing entity and the project participants

Means of validation	Caixa Econômica Federal, from Brazil (host Party) is the coordinating/managing entity (CME) responsible for communicating with the CDM Executive Board and has been taking all the necessary operational and management arrangements for the implementation. The other project participants are: International Bank for Reconstruction and Development acting as the Trustee of the Carbon Partnership Facility and Kingdom of Spain – Ministry for the Ecological Transition & Ministry of
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	Economy and Business from Spain, Norwegian Ministry of Climate and Environment from Norway and Swedish Energy Agency from Sweden. The Project participants are listed in section A.5 of the PoA-DD and the information is consistent with the contact details in Appendix 1 of the PoA-DD.
Findings	N/A
Conclusion	KBS verified that the names of the coordinating/managing entity and the project participants included in the updated PoA-DD /2/ are according to information provided at UNFCCC website and the latest version of the MoC statement in compliance with para 390 (a) (vi) of VVS for PoA version 02 /2/.

D.1.4. Post-registration changes

Type of post-registration changes (PRCs)	Confirmation (Y/N)	Validation report for PRCs	
		Version	Completion date
Corrections	N	-	-
Inclusion of monitoring plan	N	-	-
Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents	N	-	-
Changes to the programme design	N	-	-
Addition of CPA inclusion template	N	-	-
Changes specific to afforestation and reforestation activities	N	-	-
Change of coordinating/managing entity	N	-	-

D.2. Generic component project activities

D.2.1. Application and selection of methodologies and standardized baselines

Means of validation	<p>The generic CPA part of the PoA-DD was originally registered based on version 18.0 of ACM0001 – “Flaring or use of landfill gas.” /8/. For the renewal of crediting period, the submitted revised generic CPA part of the PoA-DD (version 3.0 dated 26/12/2019) /02/ correctly applies the latest version of the methodology, i.e. version 19.0 – “Flaring or use of landfill gas” /7/. Therefore, the generic CPA was validated against ACM0001 version 19.0 /7/ requirements, as described in the following sections.</p> <p>Application of selected baseline and monitoring methodology</p> <p>The purpose of the CPA is the implementation of a landfill gas collection system to flare and/or utilize LFG for i) producing electricity; ii) to supply consumers through a natural gas distribution network, dedicated pipeline or by using trucks.</p> <p>The methodology ACM0001 (version 19.0) /7/ is applicable to the generic CPA as this CPA consists of the implementation of a landfill gas collection system to flare and/or utilize LFG for producing electricity and/or to supply consumers through a natural gas distribution network, dedicated pipeline or by using trucks. The applied baseline methodology is justified as it has been demonstrated that the generic CPA ensures that:</p> <ul style="list-style-type: none"> (a) The design of the CPA encompasses an existing or new SWDS; (b) An investment was made into an existing LFG capture system to increase the recovery rate or change the use of the captured LFG, provided that: <ul style="list-style-type: none"> (i) The captured LFG was vented or flared and not used prior to the implementation of the project activity; and (ii) In the case of an existing active LFG capture system for which the amount of LFG cannot be collected separately from the project system after the implementation of the project activity and its efficiency is not impacted on by the project system: historical data on the amount of LFG capture and flared is available. <p>Will be defined at CPA level. No investment will be made to increase the recovery rate in the case of a Greenfield capture and flaring project. For existing SWDS, one</p>
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of the options (i) or (ii) will be applied.

- (c) Flare the LFG and/or use the captured LFG in any (combination) of the following ways:
 - (i) Generating electricity;
 - (ii) Generating heat in a boiler, air heater or kiln (brick firing only) or glass melting furnace; and/or
 - (iii) Supplying the LFG to consumers through a natural gas distribution network;
 - (iv) Supplying compressed/liquefied LFG to consumers using trucks;
 - (v) Supplying the LFG to consumers through a dedicated pipeline;

LFG will be flared and/or used for one of the options mentioned above excluding heat generation.

- (d) Do not reduce the amount of organic waste that would be recycled in the absence of the project activity.

The CPA will not reduce the amount of organic waste that would be recycled in the absence of the CPA. This condition will be evidenced by local and national waste managements practices.

The methodology is only applicable if the application of the procedure to identify the baseline scenario confirms that the most plausible baseline scenario is:

- (a) Atmospheric release of the LFG or capture of LFG and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons; and
- (b) In the case that the LFG is used in the project activity for generating electricity and/or generating heat in a boiler, air heater, glass melting furnace or kiln:
 - (i) For electricity generation: that electricity would be generated in the grid or in captive fossil fuel fired power plants; and or
 - (ii) For heat generation: that heat would be generated using fossil fuels in equipment located within the project boundary;
- (c) In the case of LFG supplied to the end-user(s) through natural gas distribution network, trucks or the dedicated pipeline, the baseline scenario is assumed to be displacement of natural gas.
- (d) In the case of LFG from a Greenfield SWDS, the identified baseline scenario is atmospheric release of the LFG or capture of LFG in a managed SWDS and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons.

The most plausible baseline scenario for the CPA could be one of the options listed above except heat generation.

The methodology ACM0001 (version 19.0) /7/ is applicable since:

- (a) The proposed CPA does not apply any other CDM approved methodology. ACM0001 will not be used to claim emission reductions for the displacement of fossil fuels in a kiln or glass melting furnace, where the purpose of the CDM project activity is to implement energy efficiency measures at a kiln or glass melting furnace /2/;
- (b) The management of the SWDS in the CPA will not change to meet a technical or regulatory requirement during the crediting in order to increase methane generation compared to the situation prior to the implementation of the project activity.

The "Tool to calculate the emission factor for an electricity system" version 07.0 /14/ is used since the CPA will supply electricity to the local grid and will consume electricity from the grid for internal use. The tool "Emissions from solid waste disposal sites" version 08.0 /11/ is used in order to calculate CPA's baseline emissions for *ex-ante* estimations purposes. The actual baseline emissions will be monitored. The "Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion" version 03.0 /10/ is used since there will be consumption of fossil fuel

	<p>in the CPA. The tool “Project emissions from flaring” version 03.0 /13/ is used in order to establish the calculations of the methane destruction efficiency of the open or enclosed flare and the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” version 03.0 /15/ is used in order to establish the monitoring procedures and calculations of the methane flows sent to flaring and electricity generation. The “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” version 03.0 /12/ is used for calculating project emissions when electricity is being consumed or generated.</p> <p>The tool “Determining the baseline efficiency of thermal or electric energy generation systems” (Version 02.0) /16/ is used since the CPA will have electricity generation units. The “Tool to determine the remaining lifetime of equipment” (Version 01) /17/ is used since the CPA involves the replacement of existing equipment with new equipment or which retrofit existing equipment as part of energy efficiency improvement activities. The tool “Project and leakage emissions from transportation of freight” (Version 01.1.0) /19/ is used since the CPA involves freight transportation by road.</p> <p>The tool “Combined tool to identify the baseline scenario and demonstrate additionality” (Version 07.0) /9/ is used to identify the baseline scenario and assessment of additionality. Since the program of activity is renewing the crediting period, the tool “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” (Version 03.0.1) /18/ is used in order to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism.</p> <p>The tool “Positive lists of technologies” (version 02.0) is used in order to demonstrate additionality applying the simplified procedure.</p>
Findings	CAR-02 was raised and successfully closed. The findings are discussed in Appendix 04 of the validation report.
Conclusion	<p>The assessment of the generic CPA’s compliance with the applicability criteria of ACM0001 (version 19.0) /7/ are documented in detail above.</p> <p>Hence use of the selected methodology /7/ is appropriate for the generic CPA in compliance with para 390 (a) (iii) of VVS for PoA version 02 /3/.</p>

D.2.2. Validity of original baseline or its update

Means of validation	<p>The following steps from the “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” /18/ as per CDM-EB “Validation and Verification Standard for programmes of activities” (version 02.0) /3/ were applied:</p> <p>Step 1: Assess the validity of the current baseline for the next crediting period</p> <p>The “CDM Project Standard for programmes of activities” /4/ requires assessing the impact of new relevant national and/or sectoral policies and circumstances on the baseline. The validity of the current baseline is assessed using the following Sub-steps:</p> <p>Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies</p> <p>KBS has confirmed that no relevant mandatory national and/or sectoral policies applicable to the program activity came into effect after the submission of the PoA for validation.</p> <p>For the baseline scenario – alternatives for destruction of LFG: It is not mandatory to flare the landfill gas in Brazil, according to the Brazilian National Policy on Solid Waste /22/, which is the only law that regulates the solid waste management and final destination.</p> <p>There are no policies or regulations in Brazil that require landfill gas capture or destruction other than for technical safety issues /22/.</p> <p>For the baseline scenario – use of LFG for electricity generation and for the supply of LFG to a natural gas distribution network and/or dedicated pipeline and/or distribution of compressed/liquefied using trucks.</p> <p>Concerning energetic use of the landfill gas, KBS was able to confirm that the project is in line with the Brazilian government initiatives to increase the renewable energy share in the electric matrix.</p>
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	<p>The Brazilian government created PROINFA (Program for Alternative Energy Sources) /25/ for promoting the renewable electricity generation by celebrating long-term power purchase agreements (20-year period) at a guaranteed price of at least 80% of the average energy supply tariff charged to ultimate consumers. However, the public call for the first phase of the program occurred in 2004, which no biogas projects participated. Currently, there is no indication by the Brazilian government when the second phase of the program will occur or if it will occur indeed. More recently, the government has been trying to promote micro-scale renewable electricity generation, which consumers can generate its own electricity and dispatch electricity surplus to the grid. However, these initiatives are applied to household consumers. Thus, it's KBS opinion that no new initiatives were created for the energetic use of LFG.</p> <p>Thus, it is concluded that no relevant national and/or sectorial policies affected the validity of the project activity baseline.</p> <p>Step 1.2: Assess the impact of circumstances</p> <p>There are no new national/sectoral polices/legislation/circumstances that could affect the baseline scenario during the renewal of the crediting period.</p> <p>Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested</p> <p>The continuation of atmospheric release of the LFG (partially or total) only destroying a small percentage to address safety and odour concerns is technically possible, since it is a simple management system that requires minor maintenance. No LFG would be used for energetic purposes in the absence of the project activity. In case of investment into an existing LFG capture system, the remaining technical lifetime of the equipment shall be assessed at the CPA level.</p> <p>Step 1.4: Assessment of the validity of the data and parameters</p> <p>The following parameters were only determined at the start of the crediting period and not monitored during the crediting period based in ACM0001 version 19.0 /7/ requirements and tools /9/ - /19/: OX_{top_layer}, net calorific value of methane at reference conditions, efficiency of the LFG captured system that will be installed in the project activity, ϕ, OX, F, $DOC_{f,default}$, MCF, DOC_j, k_j, f, W_x, R_u, MM_i, $SPEC_{flare}$. These parameters are properly described in the following section D.2.4.</p> <p>Conclusion on step 1</p> <p>KBS confirms that the baseline scenario is the same and is still valid as per methodology ACM0001 (version 19.0) /7/ for the second crediting period.</p> <p>Step 2: Update the current baseline and the data and parameters</p> <p>Step 2.1: Update the current baseline</p> <p>The baseline emissions for the second crediting period have been updated, without reassessing the baseline scenario, based on the latest approved version of methodology ACM0001 /7/.</p> <p>Step 2.2: Update the data and parameters</p> <p>The parameters described under step 1.4 were properly updated considering the latest versions of ACM0001 /7/ and tools /9/ - /19/.</p>
Findings	CAR-03 was raised and successfully closed. The findings are discussed in Appendix 04 of the validation report.
Conclusion	Validity of the baseline has been correctly assessed and the parameters are updated as per the Methodology Tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" /18/ in the PoA-DD submitted for the renewal of crediting period.

D.2.3. Estimated emission reductions or net anthropogenic removals

Means of validation	<p>Algorithms and/or formulae used to determine emission reductions</p> <p>The various algorithm/formulae for calculating baseline and project emissions have been transparently documented in line with the requirements of ACM0001 version 19.0 /7/.</p> <p><u>Baseline emissions:</u></p> <p>Baseline emissions are estimated as the amount of methane that would have been destroyed/combusted during the year in project scenario ($BE_{CH_4,y}$), the net quantity of electricity produced using LFG times CO_2 emissions intensity of the baseline source of electricity displaced ($BE_{EC,y}$) and the amount of methane in the LFG</p>
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which is sent to the natural gas distribution network or dedicated pipeline or to the trucks times an average CO₂ emission factor of natural gas. No thermal energy is produced.

Baseline emissions of methane from the SWDS ($BE_{CH_4,y}$) is given by the formula:

$$BE_{CH_4,y} = (1 - OX_{top-layer}) * (F_{CH_4,PJ,y} - F_{CH_4,BL,y}) * GWP_{CH_4}$$

The fraction of methane that would be oxidized in the top layer of the SWDS in the baseline ($OX_{top-layer}$) of 0.1 is according to the ACM0001 recommendations /7/.

As stated in the PoA-DD /2/, the amount of methane in the LFG that would have been captured and destroyed (by flaring) in the baseline due to regulatory or contractual requirements, to address safety and odour concerns, or for other reasons ($F_{CH_4,BL,y}$) is determined by applying one the the cases listed under table 3 of the methodology ACM0001 version 19.0 /7/ depending on the requirement to destroy methane and the existence of methane capture system in the baseline.

For the *ex-ante* estimation, the amount of methane in the LFG which is flared and/or used in the project activity in year y ($F_{CH_4,PJ,y}$) was estimated annually according the “Emissions from solid waste disposal sites” version 08.0 /11/. The $BE_{CH_4,SWDS,y}$ (amount of methane in the LFG that is generated from the SWDS in the baseline scenario in the year y) is calculated as per the Application A of the tool considering the daily amount of waste dumped and future entrances and the waste composition and is according to the tool “Emissions from solid waste disposal sites” version 08.0 /11/. The efficiency of the LFG capture system that will be installed in the project activity (η_{PJ}) is estimated at CPA level.

For the *ex-post* determination, the amount of methane in the LFG which is flared and/or used in the project activity in year y ($F_{CH_4,PJ,y}$) is determined by monitoring the quantity of methane actually flared, gas used to generate electricity and gas sent to the natural gas distribution network and/or dedicated pipeline and/or to the trucks. No thermal energy is produced.

The amount of methane in the LFG which is destroyed by flaring in year y ($F_{CH_4,flared,y}$) is determined based on quantity of landfill gas sent to the flare ($F_{CH_4,sent_flare,y}$) and the project emissions from flaring of the residual gas stream ($PE_{flare,y}$), calculated according to the “Project emissions from flaring”, version 03.0 /13/. The amount of methane in the LFG which is sent to the flare in year y ($F_{CH_4,sent_flare,y}$) is determined using the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”, version 03.0 /15/. As described in the PoA-DD, the option selected for the calculation is determined at CPA level. The flare efficiency of the enclosed flares will be determined based on monitored data or a default value while for open flares a default value must be applied as per “Project emissions from flaring”, version 03.0 /13/.

The baseline emissions associated with the electricity generation in year y ($BE_{EC,y}$) is calculated as per the tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” version 03.0 /12/. Project participant defined some possible scenarios to be chosen at CPA level: Scenario A (Electricity consumption from the grid), Option A.1 where the combined margin emission factor of the applicable electricity system is determined using the procedures in the “Tool to calculate the emission factor for an electricity system” version 07.0 /14/, Scenario B (Electricity consumption from an off-grid captive power plant), Option B.1 where the emission factor for electricity generation is determined based on the CO₂ emissions from fuel combustion and the electricity generation in the captive power plant(s) installed at the site of the electricity consumption source and Scenario C (Electricity consumption from the grid and (a) fossil fuel fired captive power plants(s)), Case C.I: Grid electricity where the implementation of the project activity only affects the quantity of electricity that is supplied from the grid and not the operation of the captive power plant, Case C.II: Electricity from captive power plant(s) where the implementation of the project activity is clearly demonstrated to only affect the quantity of electricity that is generated in the captive power plant(s) and does not affect the quantity of electricity supplied from the grid or Case C.III: Electricity from both the grid and captive power plant(s) where the implementation of the project activity may affect both the quantity of electricity that is generated in the captive power plant(s) and the quantity of electricity supplied from the grid.

In case of Option A.1, the emission factor for electricity generation for source k in year y ($EF_{EL,k,y}$) is calculated according to “Tool to calculate the emission factor for

an electricity system" /14/.

The dispatch data analysis was the option selected for the calculation of the operating margin (OM). The build margin (BM) emission factor will be determined applying Option 1. For the second crediting period, the build margin factor should be calculated *ex-ante* based on the most recent information available at the time of submission of the request for renewal of the crediting period to the DOE. According to the monitoring procedures established by the "Tool to calculate the emission factor for an electricity system" /14/, the emission factor will be determined for the year in which the project displaces the grid electricity. If data to calculate the emission factor is not available, the emission factor from the previous year (y-1) may be used. If data available is older than 18 months, than the emission factor to be used will be for year y-2. Monitoring procedures are correctly applied by the project participant.

The most recent information available by the Brazilian DNA will be used to determine the baseline emission factor.

The combined margin (CM) emission factor will be determined based on 0.25:0.75 weighting between OM and BM emission factor fixed for the second crediting period /14/.

The baseline emissions associated with natural gas use ($BE_{NG,y}$) is given by the formula:

$$BE_{NG,y} = 0.0504 \times F_{CH_4,NG,y} \times EF_{CO_2,NG,y}$$

The average CO₂ emission factor of natural gas in the natural gas network or dedicated pipeline or in trucks in year y ($EF_{CO_2,NG,y}$) is determined using the "Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion" version 03.0 /10/. The CO₂ emission coefficient $COEF_{i,y}$ can be calculated using one of the following two options: (a) Option A – based on the chemical composition of the fossil fuel type *i* or (b) Option B – based on net calorific value and CO₂ emission factor of the fuel type *i*. Option A is the preferred approach if the necessary data is available.

Project emissions:

Project emissions are estimated as the sum of emissions from consumption of electricity due to the project activity in year y ($PE_{EC,y}$), emissions from consumption of fossil fuels for purpose other than electricity generation in year y ($PE_{FC,y}$). Emissions from consumption of electricity ($PE_{EC,y}$), emissions from the distribution of compressed/liquefied LFG using trucks in year y ($PE_{DT,y}$) and emissions from the supply of LFG to consumers through a dedicated pipeline in year y ($PE_{SP,y}$).

The emissions from electricity consumption are calculated following the "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" version 03.0 /12/ and are estimated based on the amount of electricity consumed by the project activity $EC_{PJ,j,y}$ times the emission factor for electricity generation and transmission and distribution losses. The determination of the emission factor for electricity generation depends on which scenario that applies to the source of electricity consumption that would be displaced in the baseline by electricity generated in the project. One of the following options could be chosen: (i) Option A1 - calculate the combined margin emission factor of the applicable electricity system, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system" ($EF_{EL,j/k,l,y} = EF_{grid,CM,y}$), (ii) Option A2 - use the conservative default value of 1.3 tCO₂/MWh, (iii) Option B1 - the emission factor for electricity generation is determined based on the CO₂ emissions from fuel combustion and the electricity generation in the captive power plant(s) installed at the site of the electricity consumption source, (iv) Option B2 - use the conservative default value of 1.3 tCO₂/MWh, (v) Case C.I - grid electricity. The implementation of the project activity only affects the quantity of electricity that is supplied from the grid and not the operation of the captive power plant, (vi) Case C.II - electricity from captive power plant(s). The implementation of the project activity is clearly demonstrated to only affect the quantity of electricity that is generated in the captive power plant(s) and does not affect the quantity of electricity supplied from the grid, (vii) Case C.III - electricity from both the grid and captive power plant(s). The implementation of the project activity may affect both the quantity of electricity that is generated in the captive power plant(s) and the quantity of electricity supplied from the grid. According to TOOL05, case C.III

	<p>should be chosen as a conservative approach, in case of doubts, (viii) Option B3 - project emissions from consumption of electricity are determined by calculating the CO₂ emissions from all fuel combustion in the captive power plant and (ix) Option B4 - project emissions from consumption of electricity are determined based on the rated capacity of the captive power plant(s), assuming, as very conservative simplification, an emission factor of 1.3 tCO₂/MWh and an operation of 8,760 hours per year at the rated capacity.</p> <p>The emissions from consumption of fossil fuels for purpose other than electricity generation are calculated following the "Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion" version 03.0 /10/ and are based on the quantity of fuels combusted and the CO₂ emission coefficient of those fuels. The option applied to determine the CO₂ emission coefficient will be determined at CPA level.</p> <p>The emissions from the distribution of compressed/liquefied LFG using trucks are determined by the sum of emissions arising from transportation of LFG using trucks and possible leaks during the transportation. The emissions from the transportation of compressed/liquefied LFG using trucks are calculated following the "Project and leakage emissions from transportation of freight" version 01.1.0 /19/ while the emissions from methane leak are calculated as the difference between the amount of methane in the LFG which is sent to trucks and amount of methane in the LFG which is delivered to consumers using trucks.</p> <p>The emissions from the supply of LFG to consumers through a dedicated pipeline are calculated as the amount of methane in the LFG which is sent to the consumer through a dedicated pipeline times a default emission factor for the supply of LFG to consumers due to physical leakage through the dedicated pipeline.</p> <p>No leakage effects need to be accounted under the methodology used.</p> <p>Estimation of GHG emissions</p> <p>Emission reductions will be directly monitored and calculated <i>ex-post</i>, using the approach indicated in the methodology ACM0001 version 19.0 /7/ for each CPA.</p>
Findings	CL-01, CAR-04, CAR-05, CAR-06, CAR-07 and CAR-08 were raised and successfully closed. The findings are discussed in Appendix 04 of the validation report.
Conclusion	<p>The assessment team confirms that, in compliance with para 390 (a) (iv) of VVS for PoA version 02:</p> <ul style="list-style-type: none"> • All assumptions and data used by the CME/project participants are listed in the PoA-DD and/or supporting documents, including their references and sources; • All documentation used by the CME/project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PoA-DD; • All values used in the PoA-DD are considered reasonable in the context of the proposed CDM programme of activity; • The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions; • All estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in the PoA-DD.

D.2.4. Validity of monitoring plan

Means of validation	<p>The project applies the approved monitoring methodology ACM0001 (version 19.0) /7/.</p> <p>The original monitoring plan was updated based on ACM0001 (version 19.0) /7/ latest requirements.</p> <p>The project monitoring plan is in compliance with the monitoring methodology ACM0001 (version 19.0) /7/.</p> <p>Parameters determined ex-ante</p> <p>The following parameters are made available <i>ex-ante</i>:</p> <p>According to ACM0001 version 19.0 /7/:</p> <ul style="list-style-type: none"> - The fraction of methane that would be oxidized in the top layer of the SWDS in the baseline (OX_{top_layer}) of 0.1 is according to the ACM0001 /7/; - Historical amount of methane in the LFG which is captured and destroyed
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in the year prior to the implementation of the project activity ($F_{CH_4, BL, x-1}$). Information recorded by the SWDS operator. Applicable to Case 3 of section 5.4.1.3 of ACM0001;

- The GWP_{CH_4} (global warming potential - GWP) of 25 for the methane gas is correctly applied according to IPCC 2006 values /21/ /23/;
- Efficiency of the LFG captured system that will be installed in the CPA. Technical specifications of the LFG capture system to be installed (if available) or a default value of 50% according to ACM0001 version 19.0 /7/.

According to "Emissions from solid waste disposal sites" version 08.0 /11/:

- The ϕ (model correction factor to account for model uncertainties), the value correctly applied 0.75 for the SWDS located in humidity/wet climate or dry climate (Application A);
- OX (oxidation factor), value correctly applied 0.1 for solid waste disposal sites that are covered with oxidizing material such as soil or other material;
- F (fraction of methane in the SWDS gas), the value correctly applied 0.5 according to "Emissions from solid waste disposal sites" version 08.0 /11/;
- $DOC_{f, default}$ (fraction of degradable organic carbon (DOC) that can decompose), the value correctly applied 0.5 according to the "Emissions from solid waste disposal sites" version 08.0 /11/;
- $MCF_{default}$ (methane correction factor), value correctly applied 1.0 is used for anaerobic managed solid waste disposal sites that have controlled placement of waste;
- DOC_j (fraction of degradable organic carbon (by weight) in the waste type j), values correctly applied for wet waste according to the "Emissions from solid waste disposal sites" version 08.0 /11/. The values applied are:

Waste type j	DOC_j (% wet waste)
Wood and wood products	43
Pulp, paper and cardboard	40
Food, food waste, beverages and tobacco	15
Textiles	24
Garden, yard and park waste	20
Glass, plastic, metal, other inert waste	0

- k_j (decay rate for the waste type j): values applied according to mean annual temperature and mean annual precipitation. Climate data will be documented in the CPA-DD.
- f_y : Fraction of methane captured at the SWDS and flared, combusted or used in another manner. Value 0 is correctly applied as per recommendations of ACM0001 version 19.0 /7/;

According to the "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" version 03.0 /12/:

- $PP_{CP, j}$ (rated capacity of the captive power plant(s) that provide the project or leakage consumption source(s) j with electricity): name plate capacity of the captive power plant, manufacturer's specifications or catalogue references.

According to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" version 03.0 /15/:

- R_u : The universal ideal gases constant used is 8 314 Pa.m³/kmol.K is according to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /15/;
- MM_i : The molecular mass of greenhouse gas methane is 16.04 kg/kmol is according to the "Tool to determine the mass flow of a greenhouse gas in a

gaseous stream" /15/.

- MM_k : The molecular mass of greenhouse gases: nitrogen is 28.01 kg/kmol, oxygen is 32.00 kg/kmol, carbon monoxide is 28.01 kg/kmol, hydrogen is 2.02 kg/kmol, nitric oxide is 30.01 kg/kmol, nitrogen dioxide is 46.01 kg/kmol and sulphur dioxide is 64.06 kg/kmol is according to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /15/.
- MM_{H_2O} : The molecular mass of water is 18.0152 kg/kmol is according to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /15/ application criteria as the methane is the greenhouse gas considered and the remaining gases are pure nitrogen for simplification;
- P_n : The total pressure at normal conditions is 101,325 Pa is according to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /15/;
- T_n : The total temperature at normal conditions is 273.15 K is according to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /15/.

According to the "Project emissions from flaring" version 03.0 /13/:

- $SPEC_{flare}$: The manufacturer's flare specifications for temperature, for flow rate and for maintenance schedule will be defined at the CPA-DD. Only applicable in case of enclosed flares;
- $\eta_{flare,m}$: The flare efficiency for minute will be defined as 50% for open flares or 80% for low height enclosed flares or 90% for high height enclosed flares. The value will be defined at CPA level.

According to the "Tool to determine the remaining lifetime of equipment" version 01 /17/:

- RL: The remaining life time should be determined following one of the options: (a) use manufacturer's information on the technical lifetime of equipment and compare to the date of first commissioning; (b) obtain an expert evaluation or (c) use default values. The option will be defined at CPA level.

According to the "Project and leakage emissions from transportation of freight" version 01.1.0 /19/:

- $EF_{CO_2,f}$: The default CO_2 emission factor for freight transportation activity f is 245 g CO_2 /t km for light vehicles and 129 g CO_2 /t km for heavy vehicles is according to the "Project and leakage emissions from transportation of freight" /19/;

According to the "Tool to calculate the emission factor for an electricity system" version 07.0 /14/:

- $EF_{grid,BM,y}$ (build margin emission factor) the value correctly applied 0.1370 t CO_2e /MWh based on the most recent information available at Brazilian DNA /24/ at the time of submission of the request for renewal of the crediting period;
- w_{OM} (weighting of operating margin emissions factor) the default value applied 25% as per Tool to calculate the emission factor for an electricity system /14/;
- w_{BM} (weighting of build margin emissions factor) the default value applied 75% as per Tool to calculate the emission factor for an electricity system /14/.

Parameters monitored ex-post:

The monitoring plan allows for collection and archiving of the following key parameters related to the determination of emission reductions resulting from the

project activity:

According to ACM0001 version 19.0 /7/:

- Management of SWDS will be monitored annually;
- $F_{CH_4,BL,R,y}$: Amount of methane in the LFG which is flared due to a requirement in year y (t CH₄/yr) will be monitored annually if Case 2 was applied;
- $\rho_{reg,y}$: Fraction of LFG that is required to be flared due to a requirement in year y will be monitored annually if Case 2 was applied;
- $O_{pj,h}$: Operation of the equipment that consumes the LFG: Operation of the equipment will be measured hourly. One or more of the following three parameters will be monitored: temperature, flame or products generated;
- $EG_{PJ,y} = EC_{BL,k,y}$: Amount of electricity generated using LFG by the project activity in year y will be measured continuously by an electricity meter. The electricity meter will be subject to regular maintenance and testing to ensure accuracy. The electricity generation readings will be double checked by the electricity distribution company;
- $EG_{EC,y}$: Amount of electricity consumed by the project activity in year y will be measured continuously by an electricity meter. The electricity meter will be subject to regular maintenance and testing to ensure accuracy. The electricity generation readings will be double checked by the electricity distribution company;
- $F_{CH_4,NG-cons,y}$: Amount of methane in the LFG which is delivered to consumers using trucks in year y (t CH₄/yr) will be monitored per batch and aggregated annually. Determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream";
- $F_{CH_4,NG-TR,y}$: Amount of methane in the LFG which is sent to trucks in year y (t CH₄/yr) will be monitored per batch and aggregated annually. Determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream";
- $F_{CH_4,NG,y}$: Amount of methane in the LFG which is sent to the natural gas distribution network or dedicated pipeline or to the trucks in year y (t CH₄/yr) will be monitored continuous and aggregated annually in case of natural gas distribution network and dedicated pipeline or will be monitored pre-batch and aggregated annually in case of trucks. Determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream";
- CAPEX and OPEX: Total investment to implement the project and total cost to operate the project will be monitored at the first issuance request after each phase of the project is fully implemented. The monitoring of this parameter is only required for projects applying the simplified procedures to identify the baseline scenario and demonstrate additionality;
- Tariff of electricity exported: will be monitored at the first issuance request after each phase of the project is fully implemented. The monitoring of this parameter is only required for projects applying the simplified procedures to identify the baseline scenario and demonstrate additionality.

According to "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", version 03.0 /15/:

- $V_{t,db}$: Volumetric flow of the gaseous stream in time interval t on a dry basis (m³/h). The flow will be measured continuously if not specified in the underlying methodology. The flow meter's will be calibrated according to manufacturer's recommendations and/or will be performed in a frequency as per instrument specifications. No values are expected for *ex-ante* estimation of the emission reduction since the parameter is not used for *ex-ante* calculations. This parameter will be monitored if Options A was applied;
- $V_{t,wb}$: Volumetric flow of the gaseous stream in time interval t on a wet basis (m³/h). The flow will be measured continuously and data will be recorded and reported with an every minute frequency. The flow meter's will be calibrated according to manufacturer's recommendations and/or will be

performed in a frequency as per instrument specifications. No values are expected for *ex-ante* estimation of the emission reduction since the parameter is not used for *ex-ante* calculations. This parameter will be monitored if Options B or C were applied;

- $v_{i,t,db}$: Volumetric fraction of greenhouse gas i in a time interval t in a dry basis. The gas fraction will be measured continuously by a gas analyser. The calibration involves a zero check with an inert gas (nitrogen) and verification with a bottled standard gas. All calibration gases must have a certificate provided by the manufacturer and must be under their validity period. No values are expected for *ex-ante* estimation of the emission reduction since the parameter is not used for *ex-ante* calculations. This parameter will be monitored if Option B was applied and may be monitored if Options A or D were applied;
- $v_{i,t,wb}$: Volumetric fraction of greenhouse gas i in a time interval t in a wet basis. The gas fraction will be measured continuously by a gas analyser. The calibration involves a zero check with an inert gas (nitrogen) and verification with a bottled standard gas. All calibration gases must have a certificate provided by the manufacturer and must be under their validity period. No values are expected for *ex-ante* estimation of the emission reduction since the parameter is not used for *ex-ante* calculations. This parameter will be monitored if Option C was applied and may be monitored if Options A or D were applied;
- $M_{t,db}$: Mass flow of the gaseous stream in time interval t on a dry basis will be measured continuously if not specified in the underlying methodology. Calibration and frequency of calibration will be according to manufacturer's recommendations. This parameter will be monitored if Option D was applied;
- $C_{H_2O,t,db,n}$: Moisture content of the gaseous stream at normal conditions, in time interval t will be measured according to the USEPA CF42 method 4. Monitoring is required if Option 1 described in the "Determination of the absolute humidity of the gaseous stream" section of the TOOL08 is applied, or as one of the ways of proving that the gaseous stream is dry (necessary for Options A or D);
- T_i : temperature of the gaseous stream in time interval t . The temperature of the landfill gas will be measured continuously by instruments with recordable electronic signal. The equipment will be calibrated according to manufacturer's recommendations. No values are expected for *ex-ante* estimation of the emission reduction since the parameter is not used for *ex-ante* calculations;
- P_i : Pressure of the gaseous stream in time interval t will be measured continuously by instruments with recordable electronic signal. The equipment will be periodic calibrated against a primary device using a reference primary device and records of calibration procedures will be kept available as well as the primary device and its calibration certificate. Pressure transducers (either capacitive or resistive) will be calibrated monthly. No values are expected for *ex-ante* estimation of the emission reduction since the parameter is not used for *ex-ante* calculations;
- $V_{k,t,db}$: Volumetric fraction of gas k in the gaseous stream in time interval t on a dry basis will be measured continuously if not specified in the underlying methodology. The calibration involves a zero check with an inert gas (nitrogen) and verification with a bottled standard gas. All calibration gases must have a certificate provided by the manufacturer and must be under their validity period;
- $V_{k,t,wb}$: Volumetric fraction of gas k in the gaseous stream in time interval t on a wet basis will be measured continuously if not specified in the underlying methodology. The calibration involves a zero check with an inert gas (nitrogen) and verification with a bottled standard gas. All calibration gases must have a certificate provided by the manufacturer and must be under their validity period
- Status of biogas destruction device: Operational status of biogas destruction devices. Continuous monitoring and documenting may be

undertaken by recording the energy production from methane captured or the operation of the flare by means of a flame detector to demonstrate the actual destruction of methane.

- $P_{H_2O,t,Sat}$: Saturation pressure of H_2O at temperature T_t in time interval t . This parameter is solely a function of the gaseous stream temperature T_t and can be found at reference [1] of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", version 03.0 /15/ for a total pressure equal to 101,325 Pa.

According to the "Project emissions from flaring", version 03.0 /13/:

- $F_{CH_4,EG,t}$: Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period t will be measured by a third party accredited entity biannually according to an appropriate national or international standard. Monitoring of this parameter is required in the case of enclosed flares and if the project participants select Option B.1 to determine flare efficiency;
- $T_{EG,m}$: Temperature in the exhaust gas of the enclosed flare in minute m will be measured once per minute as per the tool recommendations /13/. Applicable to enclosed flares;
- $V_{i,RG,m}$: Volumetric fraction of component i in the residual gas on a dry basis in the minute m where $i = CH_4, CO, CO_2, O_2, H_2, H_2S, NH_4, N_2$ will be measured continuously using a gas analyser and values should be averaged on a minute basis. Analysers must be periodically calibrated according to the manufacturer's recommendation. A zero check and a typical value check should be performed by comparison with a standard certified gas. This parameter should be monitored only in case of enclosed flares and continuous monitoring of the flare efficiency;
- $V_{RG,m}$: Volumetric flow of the residual gas on a dry basis at reference conditions in the minute m will be measured continuously by a flow meter and values will be averaged on a minute basis. Flow meters are to be periodically calibrated according to the manufacturer's recommendation. Monitoring of this parameter is applicable in case of enclosed flares and continuous monitoring of the flare efficiency and if project participant selects to calculate $V_{RG,m}$ instead of monitoring directly;
- $M_{RG,m}$: Mass flow of the residual gas on a dry basis at reference conditions in the minute m will be measured continuously by instruments with recordable electronic signal and values will be averaged on a minute basis. Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer's specifications. Monitoring of this parameter is applicable in case of enclosed flares and continuous monitoring of the flare efficiency and if project participant selects to monitor $M_{RG,m}$ directly, instead of calculating;
- $V_{O_2,EG,m}$: Volumetric fraction of O_2 in the exhaust gas on a dry basis at reference conditions in the minute m will be measured continuously by a continuous gas analyser and values will be averaged on a minute basis. Analysers must be periodically calibrated according to the manufacturer's recommendation. A zero check and a typical value check should be performed by comparison with a standard gas. This parameter should be monitored only in case of enclosed flares and continuous monitoring of the flare efficiency;
- $FC_{CH_4,EG,m}$: Concentration of methane in the exhaust gas of the flare on a dry basis at reference conditions in the minute m will be measured continuously by a continuous gas analyser and values will be averaged on a minute basis. Analysers must be periodically calibrated according to manufacturer's recommendation. A zero check and a typical value check should be performed by comparison with a standard gas. This parameter should be monitored only in case of enclosed flares and continuous monitoring of the flare efficiency;
- $Flame_m$: Flame detection of flare in the minute m will be measured once per

minute by ultra violet flame detector or Infra-Red or both. The optical flame detector will be calibrated as per manufacturer's specification;

- Maintenance_y: Maintenance events completed in year y will be measured annually and kept in a maintenance log for two year beyond the life of the flare. The dates should be compared to the maintenance schedule to check that maintenance events were completed within the minimum time between maintenance events specified by the manufacturer. This parameter should be monitored only in case of enclosed flares and the project participant selects Option B to determine flare efficiency.

According to "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", version 03.0 /12/:

- $TDL_{j,y}$ and $TDL_{k,y}$ and $TDL_{l,y}$: Average technical transmission and distribution losses for providing electricity to source j , k or l in year y . In case of scenario B and scenario C, case C.II, assume $TDL_{j/k/l,y} = 0$ as a simplification. In case of other scenarios (scenario A and scenario C, cases C.I and C.III), choose one of the following options: 1. Use annual average value based on the most recent data available within the host country; 2. Use as default values of 20% for: (a) project or leakage electricity consumption sources; (b) baseline electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is larger than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies; 3. Use as default values of 3% for: (a) baseline electricity consumption sources; (b) project and leakage electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is smaller than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies. The parameter will be monitored annually according to the same tool;
- $FC_{n,i,t}$: Quantity of fossil fuel type i fired in the captive power plant n in the time period t will be measured continuously and aggregated at least annually. Onsite measurements or historical records / onsite measurements could be used. The parameters will be measured using either mass or volume meters (in cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift)) or using accessories such as transducers, sonar and piezoelectronic devices (if they are properly calibrated with the ruler gauge and receiving a maintenance per supplier specifications). In case of daily tanks with pre-heaters oil, the calibration will be made with the system at typical operational conditions. Only applicable if option B1 of the TOOL05 is used;
- $EG_{n,t}$: Quantity of electricity generated in captive power plant n in the time period t will be measured continuously by electricity meters and aggregated at least annually. The measurement results should be cross-checked with records for sold electricity where relevant. Only applicable if option B1 of the TOOL05 is used;
- $NCV_{i,t}$: Average net calorific value of fuel type i used in the period t . Values provided by the fuel supplier in invoices or measurements by the project participants or regional or national default values or IPCC default values at the limit of the uncertainty at a 95% confidence interval should be used. The NCV should be obtained for each fuel delivery, from which weighted average annual values for the period t should be calculated if values provided by the fuel supplier in invoices or measurements by the project participants is used. If regional or national default values is used, the NCV should be annually appropriateness reviewed. In case of IPCC value, any future revision of the IPCC Guidelines should be taken into account.

Applicable where Option B.1 is used;

- $EF_{CO_2,i,t}$: CO₂ emission factor of fossil fuel type i in the period t . Values provided by the fuel supplier in invoices or measurements by the project participants or regional or national default values or IPCC default values at the limit of the uncertainty at a 95% confidence interval should be used. The CO₂ emission factor should be obtained for each fuel delivery, from which weighted average annual values for the period t should be calculated if values provided by the fuel supplier in invoices or measurements by the project participants is used. If regional or national default values is used, the CO₂ emission factor should be annually appropriateness reviewed. In case of IPCC value, any future revision of the IPCC Guidelines should be taken into account. Applicable where Option B.1 is used;
- $EC_{PJ,j,y}$; $EC_{LE,l,y}$: Quantity of electricity consumed by the project electricity consumption source j in year y / Net increase in electricity consumption of source i in year y as a result of leakage will be measured continuously by electricity meters and at least monthly recording. The parameter will be measured by electricity meters installed at the electricity consumption sources. If applicable, measurement records will be crosschecked against available grid-sourced electricity purchasing receipts/invoices;
- $EC_{BL,k,y}$: Quantity of electricity that would be consumed by the baseline electricity consumption source k in year y will be measured continuously by an electricity meter and at least monthly recording. The parameter will be measured by electricity meters installed at the electricity consumption sources;
- $EG_{PJ,grid,y}$ or $EG_{PJ,facility,l,y}$: Quantity of electricity generated and supplied by the project power plant to the grid in year y / Quantity of electricity generated and supplied by the project power plant to the consumers/electricity consuming facility i in year y will be measured continuously by electricity meters and at least monthly recording.

According to "Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion" version 03.0 ref:

- $FC_{i,j,y}$: Quantity of fuel type i combusted in process j during the year y will be monitored continuously. The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchase quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records;
- $w_{c,i,y}$: Weighted average mass fraction of carbon in fuel type i in year y . Values provided by the fuel supplier in invoices or measurements by the project participants should be used. The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated. Applicable where Option A is used;
- $\rho_{i,y}$: Weighted average density of fuel type i in year y . Values provided by the fuel supplier in invoices or measurements by the project participants or regional or national default values should be used. The density of the fuel should be obtained for each fuel delivery, from which weighted average annual values should be calculated. Applicable where Option A is used;
- $NCV_{i,y}$: Weighted average net calorific value of fuel type i in year y . Values provided by the fuel supplier in invoices or measurements by the project participants or regional or national default values or IPCC default values at the limit of the uncertainty at a 95% confidence interval should be used. The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated if values provided by the fuel supplier in invoices or measurements by the project participants is used. If regional or national default values is used, the NCV should be annually appropriateness reviewed. In case of IPCC value, any future revision of the IPCC Guidelines should be taken into account. Applicable where Option B is used;
- $EF_{CO_2,i,y}$: Weighted average CO₂ emission factor of fuel type i in year y .

	<p>Values provided by the fuel supplier in invoices or measurements by the project participants or regional or national default values or IPCC default values at the limit of the uncertainty at a 95% confidence interval should be used. The CO₂ emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated if values provided by the fuel supplier in invoices or measurements by the project participants is used. If regional or national default values is used, the CO₂ emission factor should be annually appropriateness reviewed. In case of IPCC value, any future revision of the IPCC Guidelines should be taken into account. Applicable where Option B is used.</p> <p>According to "Project and leakage emissions from transportation of freight" version 01.1.0 /19/:</p> <ul style="list-style-type: none"> - $D_{f,m}$: Return trip distance between the origin and destination of freight transportation activity f in monitoring period m. Records of vehicle operator or records by the CPA implementer. Determined once for each freight transportation activity f for a reference trip using the vehicle odometer or any other appropriate sources (e.g. on-line sources). To be updated whenever the distance changes. Applicable where Option B is used. - $FR_{f,m}$: Total mass of freight transported in freight transportation activity f in monitoring period m. Records by the CPA implementer or records by trucks operator. Will be monitored continuously. Applicable where Option B is used. <p>According to "Tool to calculate the emission factor for an electricity system" version 07.0 /14/:</p> <ul style="list-style-type: none"> - $EF_{grid,CM,y}$: The combined margin emission factor will be determined ex-post based on the most recent information available at Brazilian DNA; the detailed calculations of the combined margin emission factor are described in section D.2.3. - $EF_{grid,OM,y}$: The operating margin emission factor will be determined ex-post based on the most recent information available at Brazilian DNA; the detailed calculations of the combined margin emission factor are described in section D.2.3. <p>Management system and quality assurance Detailed monitoring procedures, including responsibilities for project management, procedures for QA/QC of monitoring reports and calibration are defined in the PoA-DD. The monitoring plan contains all necessary parameters described in accordance with the monitoring methodology. The monitoring plan, including data management and QA/QC procedures, will give opportunity for real measurements of achieved emission reductions, which can hence be reported <i>ex-post</i> and verified. The application of the monitoring methodology is transparent and KBS considers the project participants able to implement the monitoring plan.</p>
Findings	CL-02, CAR-09, CAR-10, CAR-11 and CAR-12 were aised and successfully closed. The findings are discussed in Appendix 04 of the validation report.
Conclusion	It is KBS's opinion, that the project participants are able to implement the monitoring plan in compliance with para 390 (a) (iv) of VVS for PoA version 02/03/.

D.2.5. Eligibility criteria for inclusion of CPAs

Means of validation	According to the updated PoA /2/, the proposed CPA shall complies with the following eligibility criterions for inclusion CPA:		
	No.	Eligibility criterion - Category	Eligibility criterion - Required condition
			Supporting evidence for inclusion

	1	Geographical boundaries of CPAs consistent with the geographical boundary of the PoA.	The solid waste disposal site (SWDS) where the waste is disposed shall be clearly identified. Only municipal solid waste (MSW) shall be considered, (no hazardous wastes at the project site).	The CME will provide the Project description and geographical coordinates of the CPA as per one of following documents: <ul style="list-style-type: none"> - EIA/RIMA and/or Environmental - Licenses; - Other documents, e.g.: engineering studies, etc.
	2	Conditions to avoid double counting of GHG emission reductions or net anthropogenic GHG removals, such as unique identifications of product and end-user locations (e.g. programme logo).	The CME has established a management system/procedure to avoid double counting as presented in section B of the PoA-DD. Also, a record keeping system for each CPA under the PoA is maintained.	As described under section B of this PoA-DD, the CME will provide the confirmation of the unique geographical coordinates of the CPA.
	3	Conditions to confirm that CPAs are neither registered as CDM project, included in another registered PoAs, nor the project activities that have been deregistered.	The CPA shall not lead to double counting of emission reduction as this CPA shall not be part of any of the following categories: <ul style="list-style-type: none"> (1) Standalone CDM project activity; (2) Bundled CDM project activity; (3) Another registered PoA. 	As described under section B of this PoA-DD, a letter of intent (LoI) from the CPA implementer will be submitted in order to confirm both their voluntary participation to the proposed PoA coordinated by Caixa Econômica Federal, and that the project under the CPA is neither registered as an individual CDM project activity nor included as part of another registered PoA or that have been deregistered.
	4	Specification of the technology/measure, such as the level and type of service, as well as performance specification based on, inter alia, testing/certification.	The site hosting the CPA shall be a licensed Municipal or Regional sanitary landfill located in the host country Brazil. While there are no restrictions in terms of size of the SWDS hosting the CPA neither in terms of the amount of MSW disposed in such SWDS, the management of the SWDS	The CME, in order to demonstrate compliance with this eligibility criteria, will provide the following documents, but not limited to: <ul style="list-style-type: none"> - Environmental license; - Engineering studies; - Monitoring documents; - Other documents, e.g. quality and/or environmental

		in the CPA shall not be changed in order to increase methane generation when compared to the situation prior to the implementation of the CPA. Furthermore, the SWDS shall receive municipal solid waste only.	attesting certification.																																
5	Conditions to check the start dates of CPAs through documentary evidence.	The identification of the starting date of the proposed CPA shall be according to the CDM Glossary of Terms and is after the starting date of the PoA, i.e. 22/09/2010, when the PoA-DD was first published for global stakeholder consultation (start of the validation process).	The CME will provide the start date confirmation through one of the following documents: <ul style="list-style-type: none"> - Contract between the CPA developer and a third party related to the implementation or construction of the CPA (EPC, etc.); - Purchase order(s) of equipment - /technology or any other significant expenditure; - Any other relevant document, - e.g.: order or notice to proceed] 																																
6	Conditions to ensure compliance with the applicability of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents.	<p>The proposed CPA shall follow all the applicability conditions of ACM0001 as discussed in section I.2 of the revised PoA-DD. Also, the CPA shall be according to the baseline scenario identified in ACM0001 and presented in section I.5 of the revised PoA-DD.</p> <p>The identification of the baseline scenario is to be performed at an individual/specific CPA level following section I.5 of the revised PoA-DD.</p> <p>The CPA encompasses one of the following scenario:</p> <table border="1"> <thead> <tr> <th>#</th><th>Displ. Of a GHG intensive service</th><th>LFG release in the baseline</th><th>LFG release in the baseline</th></tr> </thead> <tbody> <tr> <td>1.1</td><td>No. LFG</td><td>Partial</td><td>Yes</td></tr> <tr> <td>1.2</td><td>flared</td><td>Total</td><td>Yes</td></tr> <tr> <td>2.1</td><td>Yes,</td><td>Partial</td><td>Yes</td></tr> <tr> <td>2.2</td><td>electricity generation</td><td>Total</td><td>Yes</td></tr> <tr> <td>3.1</td><td>Yes,</td><td>Partial</td><td>Yes</td></tr> <tr> <td>3.2</td><td>supply to consumers</td><td>Total</td><td>Yes</td></tr> <tr> <td>4.1</td><td>Yes,</td><td>Partial</td><td>Yes</td></tr> </tbody> </table>	#	Displ. Of a GHG intensive service	LFG release in the baseline	LFG release in the baseline	1.1	No. LFG	Partial	Yes	1.2	flared	Total	Yes	2.1	Yes,	Partial	Yes	2.2	electricity generation	Total	Yes	3.1	Yes,	Partial	Yes	3.2	supply to consumers	Total	Yes	4.1	Yes,	Partial	Yes	<p>The baseline scenario for emissions of methane consists of the partial or total release of LFG into the atmosphere, by assuming amount or share of methane that would have been captured and destroyed in the absence of the CPA due to regulatory or contractual requirements and/or to address safety and odour concerns, or for other reasons.</p> <p>Regarding the project scenario, LFG is flared and used for electricity generation and/or LFG supply to consumers. Also, the amount of organic waste that would be recycled in the absence of the CPA is not reduced.</p> <p>Therefore, the CPA applies one of the eight scenarios listed.</p>
#	Displ. Of a GHG intensive service	LFG release in the baseline	LFG release in the baseline																																
1.1	No. LFG	Partial	Yes																																
1.2	flared	Total	Yes																																
2.1	Yes,	Partial	Yes																																
2.2	electricity generation	Total	Yes																																
3.1	Yes,	Partial	Yes																																
3.2	supply to consumers	Total	Yes																																
4.1	Yes,	Partial	Yes																																

			4.2	electricity gen. + supply to consumers	Total	Yes		
	7	Conditions to ensure that CPAs meet the requirements for the demonstration of additionality as follows: (i) If the generic CPA applies large-scale methodologies, the conditions shall derive from the requirements contained in the additionality section of the applied methodologies; (ii) If the generic CPA is small-scale in accordance with the thresholds referred to in paragraphs 126 below and applies only small-scale methodologies, the conditions shall derive from the requirements contained in the additionality section of the applied methodologies, or if such section does not exist, from the “Methodological tool: Demonstrating additionality of small-scale project activities” and, where necessary, any applicable additionality tool; (iii) If the generic CPA is microscale in accordance with the thresholds referred to in paragraph 128 below and applies the “Methodological tool: Demonstrating additionality of microscale project activities” regardless of the scale of	The proposed CPA shall be a large scale project type and not involve combination of other methodologies than ACM0001.			The identification of the baseline scenario and additionality shall be performed at an individual/specific CPA level by following one of the applicable procedures established in section I.5.		Additionality test is conducted at the CPA level and it is discussed in section I.5 of the revised PoA-DD.

	<p>methodologies applied (i.e. large-scale methodologies, small-scale methodologies or combination thereof), the conditions shall derive from this tool;</p> <p>(iv) If investment analysis is used for the demonstration of additionality under the options referred to in subparagraphs (i) or (ii), the conditions shall:</p> <p>a. Define the input parameters that will be used in the investment analysis, together with a description of how the values for these parameters will be obtained for each CPA. The additionality of each CPA shall then be assessed by using the actual values, applicable to that CPA at the time of inclusion, in the investment analysis conducted for the purpose of demonstrating the additionality of the CPA; or</p> <p>b. Define technical and economic criteria with a range of values for each input parameter, which qualify a CPA for inclusion in the PoA. Under this</p>		
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		<p>option, the eligibility criteria shall be updated in accordance with the requirements specified in the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents, following the process of post-registration changes in accordance with the “CDM project cycle procedure for programmes of activities”. At the time of inclusion of a CPA, the coordinating/ managing entity shall assess whether the actual values applicable to the CPA at that time fall within the range;</p> <p>(v) If the generic CPA applies a combination of large-scale methodologies or large-scale and small-scale methodologies, and the combination results in changed cash-flow for individual measures in comparison to the situation where the measures are implemented separately, the conditions shall be such that additionality is</p>		
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		<p>demonstrated for the measures both individually (i.e. for each of the measures) and collectively (i.e. for the combination of the measures);</p> <p>(vi) If the generic CPA applies large-scale or small-scale A/R methodologies, the conditions shall derive from the requirements contained in the additionality section of the applied methodologies;</p> <p>(vii) If the generic CPA applies a standardized baseline that standardizes additionality, the conditions shall ensure that the applicability condition of the standardized baseline are met.</p>		
	8	<p>Conditions to ensure the compliance with other requirements of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents.</p>	<p>The proposed CPA shall follow ACM0001 and referred tool presented in section I.1, as well as CDM-PS-PoA, CDM-PCP-PoA and CDM-VVS-PoA.</p>	<p>The baseline scenario for emissions of methane consists of the partial or total release of LFG into the atmosphere, by assuming amount or share of methane that would have been captured and destroyed in the absence of the CPA due to regulatory or contractual requirements and/or to address safety and odour concerns, or for other reasons.</p> <p>Regarding the project scenario, LFG is flared and used for electricity generation and/or LFG supply to consumers. Also, the amount of organic waste that would be recycled in the absence of the CPA is not reduced.</p> <p>Therefore, the CPA</p>

			applies one of the eight scenarios listed.
9	The PoA-specific requirements, including any conditions related to undertaking local stakeholder consultation and environmental impact analysis.	<p>The local stakeholder consultation and the environmental impact analysis shall be performed at CPA level by following the Host Country requirements.</p> <p>Requirements from the Brazilian DNA shall be considered.</p> <p>Also, the site hosting the CPA must be a licensed Municipal or Regional sanitary landfill located in the host country Brazil.</p>	<p>The local stakeholder process consultation is presented in section F of the revised PoA-DD as can be checked in the following documents, but not limited to:</p> <ul style="list-style-type: none"> - Invitation letters sent to stakeholders; - Comments received during the stakeholder process; - Photos or minutes of meeting with stakeholders (if applicable); - Other related documents. <p>Regarding environmental impact, the following documents can be used to confirm compliance, but not limited to:</p> <ul style="list-style-type: none"> - Environmental studies and/or licenses; - Other documents, e.g. quality and/or environmental attesting certification.
10	Conditions to provide an affirmation that funding from Annex I parties, if any, does not result in a diversion of official development assistance.	<p>The CPA implementer shall confirm that the proposed CPA does not result in a diversion of Official Development Assistance from an Annex I country.</p> <p>In the case the implementation of the CPA requires a loan, the CPA proponent must have confirmation from the financial institution providing the loan for the CPA, where future carbon revenues have been presented for the loan evaluation and are a partial guarantee to repay the loan. In case of funding from Annex I Parties, demonstration of non-diversion of official</p>	<p>Financing contract or signed declaration from the CPA implementer can be used as supporting evidence demonstrating that the CPA does not deviate from an ODA.</p>

			development assistance (ODA) is to be provided.	
	11	Target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off-grid), and where applicable, distribution mechanisms (e.g. direct installation).	Not applicable. The CPA shall not involve a target group.	Not applicable.
	12	If the generic CPA applies sampling for the determination of parameter values for calculating GHG emission reductions or net anthropogenic GHG removals, conditions related to sampling requirements for the PoA in accordance with the "Standard: Sampling and surveys for CDM project activities and programme of activities".	Not applicable. The proposed CPA shall not applying sampling. Parameters will be monitored at CPA level according to section I.7.	Not applicable.
	13	If the generic CPA is small-scale or microscale, conditions to ensure that CPAs that will be included meet the small-scale or microscale thresholds and remain within those thresholds throughout the crediting period of the CPAs. However, if the generic CPA consists solely of units that qualify as "microscale CDM units" as defined in the "Methodological tool: Demonstration of additionality of microscale project activities", these conditions are not required.	Not applicable. The PoA considers a large scale methodology (ACM0001).	Not applicable.

	14	If the generic CPA is small-scale or microscale, conditions for the debundling check based on the "Methodological tool: Assessment of debundling for small-scale project activities". However, if the generic CPA consists solely of units that qualify as "microscale CDM units", these conditions are not required.	Not applicable. The PoA considers a large scale methodology (ACM0001).	Not applicable.
Findings	CAR-13 was raised and successfully closed. The findings are discussed in Appendix 04 of the validation report.			
Conclusion	KBS was able to confirm that the eligibility criteria for the inclusion of CPAs defined in the PoA-DD is in accordance with the applicable requirements in para 124 of the PS for PoA.			

SECTION E. Internal quality control

>> Following the completion of the assessment process and a recommendation by the assessment team, the validation opinion prepared by Team Leader is independently reviewed by internal Technical Reviewer. TR reviews if all the KBS procedures have been followed and all conclusions are justified in accordance with applicable standards, procedures, guidance and CDM decisions. The TR either is qualified for the technical area within the CDM sectoral scope(s) applicable to project activity or is supported by qualified independent technical expert at this stage.

The Technical Reviewer will either accept or reject the recommendation made by the assessment team. The findings can be raised at this stage and PP must resolve them within agreed timeline.

The opinion recommended by Technical Reviewer will be confirmed by Manager Technical & Certification and finally authorized by the Managing Director on behalf of KBS as final validation opinion. The Technical Reviewer and Manager T&C maybe be same person.

SECTION F. Validation opinion

>> KBS Certification Services Pvt. Ltd. has been contracted by 'Caixa Econômica Federal' to perform a validation of the CDM registered program of activity 'Caixa Econômica Federal Solid Waste Management and Carbon Finance Project (UNFCCC Ref #6573) in Brazil for renewal of crediting period.

The validation was performed in accordance with the UNFCCC criteria for the Clean Development Mechanism, latest version of Validation and Verification Standard for programmes of activities and related Standards/Guidance and host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The CDM program of activity will result in reductions of greenhouse gas (GHG) emissions that are real, measurable and give long-term benefits to the mitigation of climate change. In our opinion, the project meets all relevant UNFCCC, CDM criteria and all relevant host country criteria.

The review of the program of activity design documentation and the subsequent follow-up interviews have provided validation team with sufficient evidence to determine the validity of the original baseline and/or its update through an assessment. The program of activity design document (dated 26/12/2019) correctly applies large scale methodology ACM0001 version 19.0. It is demonstrated that the project baseline scenario is not changed and also all necessary parameters are updated correctly for the 2nd crediting period.

The monitoring plan provides for the monitoring of the project's emission reductions. The monitoring arrangements described in the monitoring plan are feasible within the project design, and it is validation team's opinion that the project participants are able to implement the monitoring plan.

In summary, it is validation team's opinion that the CDM project activity "Caixa Econômica Federal Solid Waste Management and Carbon Finance Project" (UNFCCC Ref #6573) in Brazil meets all relevant UNFCCC requirements for the renewal of the crediting period. Hence KBS requests the renewal of the crediting period of the program of activity.

Appendix 1. Abbreviations

Abbreviations	Full texts
ANEEL	National Electrical Energy Agency (from the Portuguese Agência Nacional de Energia Elétrica")
BE	Baseline Emissions
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CH ₄	Methane
CL	Clarification request
CM	Combined Margin
CME	Coordinating/Managing Entity
CO ₂	Carbon dioxide
CPA	Component Project Activity
DNA	Designated National Authority
DOE	Designated Operational Entity
EF	Emission Factor
EIA	Environmental Impact Assessment
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
KBS	KBS Certification Services Pvt. Ltd.
LFG	Landfill Gas
OM	Operating Margin
PDD	Project Design Document
PE	Project Emissions
PoA	Program of Activities
PoA-DD	Program of Activities Design Document
PP	Project Participant
PRC	Post registration change
PROINFA	Program for Alternative Energy Sources
PS	Project Standard
PCP	Project Cycle Procedure
RCP	Renewal of Crediting period
SWDS	Solid Waste Disposal Site
QA/QC	Quality Assurance/Quality Control
tCO _{2e}	Tonnes of CO ₂ equivalents
T&C	Technical & Certification
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Validation & Verification Standard

Appendix 2. Competence of team members and technical reviewers

Personnel Name:		Andrea Leiroz	
Qualified to work as:			
Team Leader	<input checked="" type="checkbox"/>	Technical Expert	<input checked="" type="checkbox"/>
Validator/Verifier	<input checked="" type="checkbox"/>	Financial Expert	<input type="checkbox"/>
Technical Reviewer	<input type="checkbox"/>	Local Expert (India)	<input checked="" type="checkbox"/>
Area(s) of Technical Expertise			
Sectoral Scope	Technical Area		
Energy industries (renewable/non-renewable sources)	TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar		
	TA 1.2: Energy generation from renewable energy sources		
Waste handling and disposal	TA 13.1. Solid waste and wastewater TA 13.2. Manure		
Approved by (Manager C & T)	Sanjay Kandari		
Approval date:	17/12/2018		

Personnel Name:		Rohit Badaya	
Qualified to work as:			
Team Leader	<input checked="" type="checkbox"/>	Technical Expert	<input checked="" type="checkbox"/>
Validator/Verifier	<input checked="" type="checkbox"/>	Financial Expert	<input checked="" type="checkbox"/>
Technical Reviewer	<input checked="" type="checkbox"/>	Local Expert (India)	<input checked="" type="checkbox"/>
Area(s) of Technical Expertise			
Sectoral Scope	Technical Area		
Energy industries (renewable/non-renewable sources)	TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar		
	TA 1.2: Energy generation from renewable energy sources		
Energy demand	TA 3.1. Energy Demand		
Waste Handling and Disposal	TA 13.1 Solid waste and wastewater TA 13.2 Manure		
Approved By	Manager Competency & Training		
Approval date:	16/10/2017		

Personnel Name:		Ms. Deboshmita Dey	
Qualified to work as:			
Team Leader	<input type="checkbox"/>	Technical Expert	<input type="checkbox"/>
Validator/Verifier	<input checked="" type="checkbox"/>	Financial Expert	<input type="checkbox"/>
Technical Reviewer	<input type="checkbox"/>	Local Expert	<input type="checkbox"/>
Area(s) of Technical Expertise			
Sectoral Scope	Technical Area		
-	-		
Approved by (Manager C & T)	Sanjay Kandari		
Approval date:	26/11/2019		

Personnel Name:		Ms. Shikha Sharma	
Qualified to work as:			
Team Leader	<input type="checkbox"/>	Technical Expert	<input type="checkbox"/>
Validator/Verifier	<input checked="" type="checkbox"/>	Financial Expert	<input type="checkbox"/>
Technical Reviewer	<input type="checkbox"/>	Local Expert	<input type="checkbox"/>
Area(s) of Technical Expertise			
Sectoral Scope		Technical Area	
-		-	
Approved by (Manager C & T)		Sanjay Kandari	
Approval date:		26/11/2019	

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
/1/	Caixa Econômica Federal	CDM-PoA-DD for Programme of activity "Caixa Econômica Federal Solid Waste Management and Carbon Finance Project" in Brazil for the first crediting period.	Version 7.6 of 24/11/2018.	UNFCCC website
/2/	Caixa Econômica Federal	CDM-PoA-DD for Programme of activity "Caixa Econômica Federal Solid Waste Management and Carbon Finance Project" in Brazil for the second crediting period.	Version 1.1 of 01/11/2019 Version 2.0 of 03/12/2019 Version 3.0 of 26/12/2019.	Project participant
/3/	CDM Executive Board	Clean Development Mechanism Validation and Verification Standard for programmes of activities.	Version 02.0	UNFCCC website
/4/	CDM Executive Board	Clean Development Mechanism Project Standard for programmes of activities.	Version 02.0	UNFCCC website
/5/	CDM Executive Board	Clean Development Mechanism Project Cycle Procedure for programmes of activities.	Version 02.0	UNFCCC website
/6/	CDM Executive Board	CDM-PoA-DD-FORM: Programme of activities design document form.	Version 9.0	UNFCCC website
/7/	CDM Executive Board	Large-scale Consolidated Methodology ACM0001: Flaring or use of landfill gas.	Version 19.0	UNFCCC website
/8/	CDM Executive Board	Large-scale Consolidated Methodology ACM0001: Flaring or use of landfill gas.	Version 18.0	UNFCCC website
/9/	CDM Executive Board	TOOL02: Methodological tool: Combined tool to identify the baseline scenario and demonstrate additionality.	Version 07.0	UNFCCC website
/10/	CDM Executive Board	TOOL03: Methodological tool: Tool to calculate project or leakage CO ₂ emissions from fossil fuel	Version 03.0	UNFCCC website

		combustion.		
/11/	CDM Executive Board	TOOL04: Methodological tool: Emissions from solid waste disposal sites.	Version 08.0	UNFCCC website
/12/	CDM Executive Board	TOOL05: Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation.	Version 03.0	UNFCCC website
/13/	CDM Executive Board	TOOL06: Methodological tool: Project emissions from flaring.	Version 03.0	UNFCCC website
/14/	CDM Executive Board	TOOL07: Methodological tool: Tool to calculate the emission factor for an electricity system.	Version 07.0	UNFCCC website
/15/	CDM Executive Board	TOOL08: Methodological tool: Tool to determine the mass flow of a greenhouse gas in a gaseous stream.	Version 03.0	UNFCCC website
/16/	CDM Executive Board	TOOL09: Methodological tool: Determining the baseline efficiency of thermal or electric energy generation systems.	Version 02.0	UNFCCC website
/17/	CDM Executive Board	TOOL10: Methodological tool: Tool to determine the remaining lifetime of equipment.	Version 01	UNFCCC website
/18/	CDM Executive Board	TOOL11: Methodological tool: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period.	Version 03.0.1	UNFCCC website
/19/	CDM Executive Board	TOOL12: Methodological tool: Project and leakage emissions from transportation of freight.	Version 01.1.0	UNFCCC website
/20/	CDM Executive Board	TOOL32: Methodological tool: Positive lists of technologies.	Version 02.0	UNFCCC website
/21/	CDM Executive Board	Standard for application of the global warming potentials to clean development mechanism project activities and programmes of activities for the second commitment period of the Kyoto protocol.	Version 01.0, EB69, annex 3	UNFCCC website
/22/	Republic Federative of Brazil	National Policy on Solid Waste. Law #12305. Available at: http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/lei/l12305.htm .	02/08/2010	Government website
/23/	Intergovernmental Panel on Climate Change (IPCC)	Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Available at: http://www.ipcc.ch .		IPCC website
/24/	Interministerial Commission in Global Climate Change (DNA of Brazil)	Carbon Emission Factor for the National Grid. Available at: https://www.mctic.gov.br/mctic/ope ncms/ciencia/SEPED/clima/textog eral/emissao_despacho.html .		DNA website
/25/	National Electrical Energy Agency (ANEEL)	Program for Alternative Energy Sources. Available at: https://www.aneel.gov.br/proinfra .		ANEEL website

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

Table 1. CL from this validation

CL ID	01	Section no.	D.2.3	Date:	02/12/2019
Description of CL					
PoA-DD – Section I.6.1: It is not clearly stated in the PoA-DD if there is or not baseline emissions associated with heat generation. In addition, it is not clear which option is applied in order to determine the parameters required to apply the FOD model.					
Project participant response					Date: 03/12/2019
Section I.6.1 and I.2 were revised to make clear that heat generation is not included in the PoA boundary. Figure 6 was also revised. Please refer to the second version of the document.					
Documentation provided by project participant					
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 					
DOE assessment					Date: 10/12/2019
KBS verified that section B.6.1 of the PoA-DD was revised and it is clear that there is no baseline emissions associated with heat generation. Thus, this CL is closed.					

CL ID	02	Section no.	D.2.4	Date:	02/12/2019
Description of CL					
PoA-DD – Section I.6.2: It is not clearly in the PoA-DD if the default values for tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” were applied. Thus, if parameters are not used, CME is requested to remove the same parameter from Section I.6.2.					
Project participant response					Date: 03/12/2019
Section I.6.2 of the PoA-DD was revised to consider only parameters fixed ex-ante according to TOOL05. Please refer to the second version of the document.					
Documentation provided by project participant					
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 					
DOE assessment					Date: 10/12/2019
KBS verified that section I.6.2 of the PoA-DD was revised and the parameters listed are according to the for tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”. Thus, this CL is closed.					

Table 2. CAR from this validation

CAR ID	01	Section no.	D.1.1	Date:	02/12/2019
Description of CAR					
PoADD – Section A.3: The description of the components of a typical CPA changed from the registered PoA-DD. CME is requested to clarify why information regarding installation of a backup captive off-grid electricity generator(s) (fuelled by diesel) (applicable for all CPA design scenarios) and eventual consumption of fossil fuel (for purpose other than electricity generation and/or transportation of upgraded LFG) (applicable for all CPA design scenarios) were removed from the section A.3 of the PoA-DD. In addition, PDD with track changes to identify the differences between the registered PDD and updated PDD should be provided.					
Project participant response					Date: 03/12/2019
Information regarding backup power generation and fossil fuel used for purpose other than electricity generation and/or transportation of upgraded gas were included in section A.3 of the PoA-DD. The PoA-DD is also tracked considering the registered version available at the UNFCCC's website (1 st crediting period). Please refer to the second version of the document.					
Documentation provided by project participant					
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 					

DOE assessment	Date: 10/12/2019
KBS verified that section A.3 of the PoA-DD was revised and PP described the components of a typical CPA according to the registered PoA-DD. Thus, this CAR is closed.	

CAR ID	02	Section no.	D.2.1	Date: 02/12/2019
Description of CAR				
PoA-DD – Section I.2: The PoA-DD does not assess all the applicability criteria established in the applied methodology ACM0001 version 19.0. CME is requested to justify each applicability criteria of the applied methodology in the PoA-DD.				
Project participant response				Date: 03/12/2019
Section I.2 (table 3) of the PoA-DD was revised to detail the applicability criteria following ACM0001. Please refer to the second version of the document.				
Documentation provided by project participant				
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 				
DOE assessment				Date: 10/12/2019
KBS verified that section B.2 of the PoA-DD was correctly updated according to ACM0001 and all applicability criteria established in the applied methodology were justified. Thus, this CAR is closed.				

CAR ID	03	Section no.	D.2.2	Date: 02/12/2019
Description of CAR				
PoA-DD – Appendix 3: Under Step 2.1 it is stated third crediting period instead of second crediting period.				
Project participant response				Date: 03/12/2019
Appendix 3 was revised to correct information regarding the current renewal of the crediting period. Please refer to the second version of the document.				
Documentation provided by project participant				
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 				
DOE assessment				Date: 10/12/2019
KBS verified that Appendix 3 of the PoA-DD was correctly updated. Thus, this CAR is closed.				

CAR ID	04	Section no.	D.2.3	Date: 02/12/2019
Description of CAR				
PoA-DD – Section I.6.1: It is stated under “ Option D: flow of gaseous stream in <u>dry</u> basis and volume fraction in <u>dry or wet</u> basis” that: “The mass flow of greenhouse gas i ($F_{i,t}$) is determined according to equations 26 and 27”. However, the number of the equations is not correct.				
Project participant response				Date: 03/12/2019
Section I.6.1 was revised to correct the number of equations applied in option D. Please refer to the second version of the document.				
Documentation provided by project participant				
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 				
DOE assessment				Date: 10/12/2019
KBS verified that the number of the equations were correctly updated in the revised PoA-DD. Thus, this CAR is closed.				

CAR ID	05	Section no.	D.2.3	Date: 02/12/2019
Description of CAR				
PoA-DD – Section I.6.1: It is missing the description of some parameters of equation 33 and of all parameters of equation 34.				
Project participant response				Date: 03/12/2019
Section I.6.1 was revised to include description of parameters applied to equations 33 and 34. Please refer to the second version of the document.				
Documentation provided by project participant				
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 				

DOE assessment	Date: 10/12/2019
KBS verified that the description of parameters applied to equations 33 and 34 was included in the revised PoA-DD. Thus, this CAR is closed.	

CAR ID	06	Section no.	D.2.3	Date: 02/12/2019
Description of CAR				
PoA-DD – Section I.6.1: Project emissions from consumption of electricity. The description of source j under equation 43 is not correct. Moreover, the last paragraph under this section is not clear.				
Project participant response				Date: 03/12/2019
Section I.6.1 was revised to detail options available for the calculation of project emissions due to electricity consumption following TOOL05, including default values for $EF_{EL,j,y}$ determination. Please refer to the second version of the document.				
Documentation provided by project participant				
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 				
DOE assessment				Date: 10/12/2019
KBS verified that the description of source j under equation 43 is now correct in the revised PoA-DD. In addition, information regarding the determination of the emission factor for electricity generation for source j in year y was clearly described in the revised PoA-DD. Thus, this CAR is closed.				

CAR ID	07	Section no.	D.2.3	Date: 02/12/2019
Description of CAR				
PoA-DD – Section I.6.1: Project emissions from consumption of fossil fuel. Information regarding the method to calculate $COEF_{i,y}$ is not complete.				
Project participant response				Date: 03/12/2019
Section I.6.1 was corrected in order to include all equations available for the $COEF_{i,y}$ calculation. Please refer to the second version of the document.				
Documentation provided by project participant				
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 				
DOE assessment				Date: 10/12/2019
KBS verified that information regarding the method to calculate $COEF_{i,y}$ is complete in the revised PoA-DD. Thus, this CAR is closed.				

CAR ID	08	Section no.	D.2.3	Date: 02/12/2019
Description of CAR				
PoA-DD – Section I.6.1: Missing information regarding open flare under “Step 2 Determination of flare efficiency”. Moreover, under this step, it is not clearly described how flare efficiency for enclosed flares will be determined.				
Project participant response				Date: 03/12/2019
Section I.6.1 was revised to include default value for open flares and all equations available for the determination of flare efficiency for enclosed flares. Please refer to the second version of the document.				
Documentation provided by project participant				
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 				
DOE assessment				Date: 10/12/2019
KBS verified that information regarding open flare under “Step 2 Determination of flare efficiency” was included in the revised PoA-DD. Moreover, CME included a description on how flare efficiency for enclosed flares will be determined. Thus, this CAR is closed.				

CAR ID	09	Section no.	D.2.4	Date: 02/12/2019
Description of CAR				

PoA-DD – Section I.6.2: According to tool “Emissions from solid waste disposal sites”:	
<ul style="list-style-type: none"> • Default value for the model correction factor to account for model uncertainties: information provided for “Source of data” is not properly addressed as per tool; • Oxidation factor: information provided for “Source of data” is not properly addressed as per tool; • Fraction of methane in the SWDS gas: information provided for “Source of data” is not properly addressed as per tool; • Default value for the fraction of degradable organic carbon in MSW that decomposes in the SWDS: information provided for “Source of data” is not properly addressed as per tool; • Methane correction factor: information provided for “Source of data” is not properly addressed as per tool; • Fraction of degradable organic carbon in the waste type j: information provided for “Source of data” is not properly addressed as per tool; • Decay rate for the waste type j: information provided for “Source of data” is not properly addressed as per tool. 	
Project participant response	Date: 03/12/2019
Based on the DOE comments, the source of data of the following parameters were revised according to TOOL04:	
<ol style="list-style-type: none"> 1. Φ_{default}; 2. OX; 3. F; 4. $DOC_{f,\text{default}}$; 5. MCF_{default}; 6. DOC_j; 7. k_j. 	
Please refer to the second version of the PoA-DD.	
Documentation provided by project participant	
<ul style="list-style-type: none"> • 20191203_CEF_PoA-DD_v.2-track.docx. 	
DOE assessment	Date: 10/12/2019
KBS verified that information provided for “Source of data” was properly addressed as per tool for all parameters listed in the revised PoA-DD.	
Thus, this CAR is closed.	

CAR ID	10	Section no.	D.2.4	Date: 02/12/2019
Description of CAR				
PoA-DD – Section I.7.1: According to tool “Emissions from solid waste disposal sites”:				
<ul style="list-style-type: none"> • Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y: Value 0 is correctly applied as per recommendations of ACM0001 version 19.0 /7/. However, this parameter was included under section of monitoring parameters. 				
Project participant response				Date: 03/12/2019
According to TOOL04, f_y parameter is listed as “data and parameters monitored” and, therefore, it was included in section I.7.1. However, this parameter was excluded as this value should be zero according to ACM0001.				
Documentation provided by project participant				
<ul style="list-style-type: none"> • 20191203_CEF_PoA-DD_v.2-track.docx. 				
DOE assessment				Date: 10/12/2019
KBS verified that the parameter fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y was correctly removed from section I.7.1. However, since this parameter is fixed ex-ante, it should be included under section I.6.2. This CAR is still open.				
Project participant response				Date: 26/12/2019
f_y parameter was included in section I.6.2 of the PoA-DD. Please refer to the third version of the document.				
Documentation provided by project participant				
<ul style="list-style-type: none"> • 20191226_CEF_PoA-DD_v.3-track.docx. 				
DOE assessment				Date: 26/12/2019
KBS verified the revised PoA-DD and confirmed that the parameter fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y was correctly included in section I.6.2.				
Thus, this CAR is closed.				

CAR ID	11	Section no.	D.2.4	Date: 02/12/2019
Description of CAR				
PoA-DD – Section I.7.1: According to “Tool to calculate the emission factor for an electricity system”:				
<ul style="list-style-type: none"> Combined margin emission factor for the grid: it was included under TOOL05 and not TOOL07. In addition, the information provided at “Source of data”, “Measurements methods and procedures”, “Monitoring frequency” and “QA/QC procedures” are not properly addressed as per tool. 				
Project participant response				Date: 03/12/2019
EF _{grid,CM,y} parameter is included as a monitored parameter under TOOL05 (page 14 of TOOL05). Also, this parameter is not listed under TOOL07 (but parameters to reach EF _{grid,CM,y} only). Then, parameter was not included in under TOOL07. However, source of data, measurement methods and procedures, monitoring frequency, QA/QC procedures and additional comment were revised following TOOL05. Please refer to the second version of the document.				
Documentation provided by project participant				
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 				
DOE assessment				Date: 10/12/2019
KBS verified the revised PoA-DD and confirmed that information provided at “Source of data”, “Measurements methods and procedures”, “Monitoring frequency” and “QA/QC procedures” are properly addressed as per tool. In addition, the parameter combined margin emission factor for the grid was included under the correct tool. Thus, this CAR is closed.				

CAR ID	12	Section no.	D.2.4	Date: 02/12/2019
Description of CAR				
PoA-DD – Section I.7.1: According to “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”:				
<ul style="list-style-type: none"> Pressure of the gaseous stream: Information provided under “QA/QC procedures” is not properly addressed as per tool. 				
Project participant response				Date: 03/12/2019
Section I.7.1 was revised to consider QA/QC procedures for the P _t parameter according to TOOL08. Please refer to the second version of the document.				
Documentation provided by project participant				
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 				
DOE assessment				Date: 10/12/2019
KBS verified the revised PoA-DD and confirmed that information provided at “QA/QC procedures” is properly addressed as per tool. Thus, this CAR is closed.				

CAR ID	13	Section no.	D.2.5	Date: 02/12/2019
Description of CAR				
PoA-DD – Section K: The PoA-DD does not assess all the eligibility criteria for the inclusion of CPAs established in the PS PoA. CME is requested to justify each eligibility criteria listed in the PS PoA.				
Project participant response				Date: 03/12/2019
Section K of the PoA-DD was revised considering the latest version of the CDM-PS-PoA. Please refer to the second version of the document.				
Documentation provided by project participant				
<ul style="list-style-type: none"> 20191203_CEF_PoA-DD_v.2-track.docx. 				
DOE assessment				Date: 10/12/2019
KBS verified that section K of the PoA-DD was correctly updated according to PS PoA and all eligibility criteria established in the standard were justified. Thus, this CAR is closed.				

Table 3. FAR from this validation

FAR ID	xx	Section no.		Date: DD/MM/YYYY
Description of FAR				

Project participant response	Date: DD/MM/YYYY
Documentation provided by project participant	
DOE assessment	Date: DD/MM/YYYY

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
02.0	31 May 2019	Revision to: <ul style="list-style-type: none">• Ensure consistency with version 02.0 of the “CDM validation and verification standard for programmes of activities” (CDM-EB93-A08-STAN) and version 02.0 of the “CDM project cycle procedure for programmes of activities” (CDM-EB93-A09-PROC);• Make editorial improvements.
01.0	29 December 2017	Initial publication.

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