




**Validation report form for post-registration changes for  
CDM project activities  
(Version 02.0)**

**BASIC INFORMATION**

<b>Title and UNFCCC reference number of the project activity</b>	Caieiras landfill gas emission reduction (UNFCCC reference number 0171)
<b>Process track</b>	<input checked="" type="checkbox"/> Prior approval <input type="checkbox"/> Issuance <input type="checkbox"/> Renewal of crediting period
<b>Version number of the validation report on PRCs</b>	04.0
<b>Completion date of the validation report on PRCs</b>	25/07/2018
<b>Type(s) of PRCs</b>	<input type="checkbox"/> Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines <input checked="" type="checkbox"/> Corrections <input type="checkbox"/> Changes to the start date of the crediting period <input type="checkbox"/> Inclusion of a monitoring plan <input checked="" type="checkbox"/> Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools <input checked="" type="checkbox"/> Changes to the project design <input type="checkbox"/> Changes specific to afforestation and reforestation project activities
<b>Version number of PDD to which this report applies</b>	PDD Version 9.0 (dated 20/07/2018)
<b>Project participants</b>	Essencis Soluções Ambientais S.A. Nordic Environment Finance Corporation
<b>Host Party</b>	Brazil
<b>Applied methodologies and standardized baselines</b>	ACM0001 - "Flaring or use of landfill gas" (version 13.0.0)
<b>Mandatory sectoral scopes linked to the applied methodology</b>	13 - Waste handling and disposal
<b>Conditional sectoral scopes linked to the applied methodologies</b>	1 - Energy industries (renewable - / non-renewable sources)
<b>Name and UNFCCC reference number of the DOE</b>	EPIC Sustainability Services Pvt. Ltd. (EPIC)

<b>Name, position and signature of the approver of the validation report on PRCs</b>	Mr. K Sudheendra (Head - Operations) 
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**SECTION A. Executive summary**

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**Background and summary of the post-registration changes:**

EPIC Sustainability Services Pvt. Ltd. (EPIC) was commissioned by the project participant Essencis Soluções Ambientais S.A. to perform an independent validation assessment of post-registration changes applicable for the previously registered CDM project activity titled “Caieiras landfill gas emission reduction” (UNFCCC Project no. 0171). The post-registration changes valid for the CDM project activity were assessed and addressed by EPIC under the “Prior approval” process track and encompasses the following types/categories:

- Permanent changes in the project design
- Permanent changes from the registered monitoring plan
- Corrections in information made available in the PDD (that do not affect the project design)

All post-registration changes (PRCs) were addressed by the project participant through the completion of a revised PDD for the project activity that is valid for its 2<sup>nd</sup> 7-year renewable crediting period (PDD version 9.0, dated 20/07/2018) <sup>/2/</sup>. This Validation Opinion Report thus includes the complete assessment and the validation opinion of EPIC for all post-registration changes valid for the registered CDM project activity as per such latest version of its revised PDD.

In accordance with applicable guidance of the latest version of the CDM project standard for project activities (CDM-PS-PA) (version 01.0) <sup>/18/</sup>, the EPIC assessment and validation opinion for all applicable post-registration changes are combined into a single Validation Opinion Report (to be submitted to the CDM Executive Board (CDM-EB) for approval under the “Prior approval” process track)<sup>1</sup>.

Also in accordance with applicable CDM requirements, the revised PDD (version 9.0, dated 20/07/2018) <sup>/2/</sup> correctly applies the latest version of the CDM-PDD form (version 10.1) <sup>/20/</sup>. Moreover, such revised PDD <sup>/2/</sup> was verified by EPIC as being completed by correctly taking into account all applicable guidance/requirements for completing the CDM-PDD form (version 10.1) <sup>/20/</sup> (as established by its attachment “Instructions for completing this form”). For the completion of the revised PDD <sup>/2/</sup>, besides of addressing all post-registration changes encompassed by this Validation Opinion Report, previously existent project description information and data (as per the currently registered version of the PDD (version 6.0, dated 17/05/2016) <sup>/3/</sup>) were also confirmed as being fully and correctly considered in the completion of the revised PDD, as required by applicable CDM rules.

**Brief summary of the project activity:**

As outlined in both the currently registered version of the PDD valid for the 2<sup>nd</sup> 7-year crediting period (version 6.0, dated 17/05/2016) <sup>/3/</sup> and also highlighted in the revised PDD (version 9.0, dated 20/07/2018) <sup>/2/</sup>, the project activity was initially conceived, implemented and has operated (during the period from year 2007 to the end of June 2016) as a project based initiative implemented at the UVS - Caieiras landfill promoting methane destruction as its GHG abatement measure through efficient collection landfill gas (LFG) and its combustion in high temperature enclosed flares. LFG (which is rich in CH<sub>4</sub>) has been historically generated at the UVS - Caieiras landfill as result of the anaerobic decomposition of municipal solid waste (MSW) disposed in such landfill site through the application of appropriate MSW landfilling techniques and procedures.

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<sup>1</sup> Although the implemented corrections (in information that do not affect the project design) were confirmed by the EPIC assessment team as being permanent post-registration changes that *per se* would not require prior approval by the CDM-EB, since the other permanent post-registration changes assessed in this Validation Opinion Report (permanent changes in the project design + permanent changes from the registered monitoring plan) represent changes that do require prior approval by the CDM-EB (as established by the CDM project standard for project activities (CDM-PS-PA) <sup>/18/</sup>), the combined assessment of post-registration changes encompassed by this Validation Opinion Report is thus to be submitted to the CDM-EB under the “prior approval” process track.

The UVS - Caieiras landfill is located on the extreme Northeast of Caieiras municipality, on the Metropolitan Area of São Paulo (RMSP). The site access is through Bandeirantes Highway, km 33.

The project geographical coordinates are as follows:

- Latitude: 23° 20' 36" S or -23.343232
- Longitude: 46° 46' 11" W or -46.769788

Under its revised project design configuration (that is assessed in this Validation Opinion Report as a permanent post-registration change in the project design), methane destruction occurs through combustion of collected LFG also in a set of internal combustion gas engines to be fully installed as per a time plan outlined in the revised PDD <sup>/2/</sup> which are regarded as additional (alternative) methane destruction devices as part of the project design description also included in the revised PDD <sup>/2/</sup>.

It is relevant to note that such set of internal combustion gas engines (21 units during the period from Jul./2016 to Dec./2018; 25 units during the period from Jan./2019 to Dec./2019 and 27 units from year 2020 onwards as per the currently valid implementation plan) are all part of a grid-connected electricity generation infrastructure entirely fuelled by LFG that, after conclusion of all construction and commissioning related activities, started to operate within the geographical limits of the UVS – Caieiras landfill in Jul./2016<sup>2</sup>.

It is relevant to note that as part of the operation of the project activity under its revised design configuration, the project activity will not encompass electricity generation as an addition GHG abatement measure and it will thus remain having methane destruction as its unique measure. Thus, no emission reductions associated to electricity generation will be accounted and/or claimed as part of the project activity (i.e. CO<sub>2</sub> emission reductions due to generation of electricity, displacing equivalent amount of electricity that would otherwise be generated by existing grid-connected power plants (including fossil-fuel fired power plants (and addition of new power generation units)) within the National Electricity Grid of Brazil). The rationale and justification for the non-inclusion, as part of the project activity of electricity generation as additional GHG abatement measure + non-accounting of emission reductions associated to generation of electricity are sufficiently explained in Section A.3 of the revised PDD <sup>/2/</sup>.

Furthermore, despite of the gradual/phased installation of a set of internal combustion gas engines as alternative/additional methane destruction devices as part of the project activity under its current design configuration, no quantitative increase in terms of methane destruction is expected to occur.

In summary, under its revised design configuration, the project activity thus remains promoting mitigation of emissions of methane (CH<sub>4</sub>) into the atmosphere (that would occur in the absence of the project activity (baseline scenario)).

Also in accordance to the revised project design configuration and as also appropriately outlined in the revised PDD <sup>/2/</sup>, a backup captive off-grid electricity generator (fuelled by diesel) was installed and made under operational status at the project site in July/2016 as an occurred permanent change in the project design.

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<sup>2</sup> The grid-connected electricity generation infrastructure (for which the set of internal combustion gas engines represents major components) is expected to be fully implemented under a gradual/phased implementation and it entered into continuous operations in July/2016. As confirmed by the EPIC assessment team, continuous supply of LFG to the set of internal combustion gas engines started on 11/07/2016 upon conclusion of all required testing and commissioning work.

As also confirmed by the EPIC assessment team, this backup electricity generator has been used uniquely for meeting the project's electricity demand during temporary planned or unplanned circumstances whenever supply of grid-sourced electricity to the project activity is temporarily interrupted<sup>3</sup>.

As also outlined in the revised PDD <sup>/2/</sup>, in addition to above-summarized permanent changes in the project design, permanent changes in the monitoring plan and corrections (in information that do not affect the project design) are also implemented as post-registration changes.

As outlined in Appendix 7 of the revised PDD <sup>/2/</sup>, the permanent changes from the registered monitoring plan are summarized as follows:

- Revision of the applied monitoring and GHG calculation approaches by including additional monitoring requirements and calculation approaches for determining the following emissions as a result of the changes in the project design:
  - (i) Baseline emissions for methane (due to destruction of LFG (rich in methane) also occurring in the set of internal combustion gas engines (regarded as additional/alternative methane destruction devices).
  - (ii) Project emissions (due to the consumption of electricity sourced by the installed backup captive off-grid electricity generator (fuelled by diesel)).  
Project emissions due to consumption of electricity (sourced by the grid or backup generator (fuelled by diesel)) by the project activity will be determined by applying guidance of Scenario C of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) to these sources of electricity consumption.

As a result of the related revision of the applied GHG calculation and monitoring approaches, additional ex-ante determined parameters and parameters monitored ex-post are added (i.e.  $Op_{j,h}$ ,  $EF_{EL,captive,y}$ ,  $EF_{EL,grid,y}$ ,  $EC_{PJ,captive,y}$ ,  $FC_{Diesel,y}$ ,  $NCV_{Diesel,y}$ ,  $EF_{CO2,Diesel,y}$ ,  $EG_{Diesel-Generator,y}$  and  $TDL_{captive,y}$ ) and the parameter  $TDL_{grid,y}$  will be monitored ex-post (as established by the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption").

As also outlined in Appendix 7 of the revised PDD <sup>/2/</sup>, the corrections (in information that do not affect the project design) are summarized as follows:

- General text and terminology revision of project description in order to fully comply with the currently applicable requirements for completing the CDM-PDD form (version 10.1) (as established by its attachment "Instructions for completing this form") and to enhance/improve the project design description.
- Minor text improvements (incl. review of statements and correction of previously existent typographic mistakes) in order to improve the overall project description.

<sup>3</sup> It is relevant to note that following disclaimer is added in the revised PDD <sup>/2/</sup> regarding any consumption by the project activity of electricity generated/sourced by the grid-connected electricity generation infrastructure fuelled by collected LFG and located within the geographical limits of the UVS – Caieiras landfill:

*"(...) since the project activity does not encompass electricity generation as a GHG abatement measure and no emission reductions due to displacement of a more-GHG-intensive service (due to generation of electricity using collected LFG as fuel) are thus eligible and/or claimable; any consumption by the project activity of electricity sourced/generated by the grid-connected electricity generation infrastructure fuelled by LFG located within the geographical limits of the UVS – Caieiras landfill (for which the set of internal combustion gas engines represents the major components) will be regarded and accounted as consumption of grid-sourced electricity (with related project emissions being accounted and determined ex-post)."*

- Revision of ex-ante estimates of emission reductions to be achieved by the project activity during its 2<sup>nd</sup> 7-year crediting period (by *inter alia* taking into account the determination of project emissions due to consumption of electricity by the project activity through application of Scenario C of the methodological tool “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 01)).
- The name of the landfill hosting the project activity is changed from “CTR Caieiras landfill” to “UVS - Caieiras landfill” reflecting the occurred change in early 2017 of the designation of the landfill hosting the project activity that was made by the project participant and project owner Essencis Soluções Ambientais S.A. as part of the operationalization of the company’s commercial, marketing and sustainability strategy.
- Updated contact information details for the project participant Essencis Soluções Ambientais S.A. is added (in line with the latest version of the completed Modalities of Communication (MoC) form for the project activity).
- Details about performed task-force involving capital and labor intensive maintenance, repair and parts replacement work in existing project’s LFG collection infrastructure and operational improvements for such infrastructure held during the period from July/2016 to July/2017 are added in Section A.3.

Scope and objective of the validation assessment for post-registration changes:

The objective of the validation assessment for PRCs is to have an independent evaluation (validation opinion) being performed by a Designated Operational Entity (DOE) for project related documents (including, if applicable, a revised PDD of a project activity) in order to validate occurred and/or yet to occur (planned) post-registration changes of a registered CDM project activity vis-à-vis applicable CDM rules and requirements for addressing PRCs.

The validation assessment for PRCs aims to confirm whether PRCs applicable for a particular registered CDM project activity are correctly addressed by the project participant(s) and/or are under compliance with all applicable related CDM rules and requirements.

In summary, the objective of the validation assessment for PRCs of a CDM project activity is thus, by *inter alia* following applicable guidance and requirements from the CDM validation and verification standard for project activities (CDM-VVS-PA) <sup>/1/</sup>, performing an independent third party assessment in order to determine whether the project participant(s) has/have *inter alia* correctly revised the PDD and other documentation (if applicable) as per the latest guidance from the CDM-EB as established in the latest versions of the CDM project standard for project activities (CDM-PS-PA) (version 01.0) <sup>/18/</sup>, CDM project cycle procedure for project activities (CDM-PCP-PA) (version 01.0) <sup>/36/</sup> and other relevant guidance/standard.

The outcome/result of a validation assessment for PRC(s) is a positive or negative validation opinion regarding its/their compliance with all applicable criteria/requirements and recommending or not its/their subsequent approval by the CDM-EB.

In the particular case of the assessed PRCs for the considered project activity, the validation assessment was carried out on the basis of the following rules and requirements that are applicable for the particular case of the PRCs for the project activity:

- Article 12 of the Kyoto Protocol <sup>/9/</sup>,
- Guidelines for the implementation of Article 12 of the Kyoto Protocol as presented in the Marrakech Accords under decision 3/CMP.1 <sup>/9/</sup> and subsequent decisions made by the Executive Board and COP/MOP,
- Other relevant rules, including applicable and valid host country legislation/regulations,
- The CDM validation and verification standard for project activities (CDM-VVS-PA) version 01.0 <sup>/1/</sup>,

- The currently registered version of the PDD of the project activity which is valid for its 2<sup>nd</sup> 7-year crediting period (version 6.0, dated 17/05/2016) <sup>/3/</sup>
- The revised PDD (version 9.0, dated 20/07/2018) <sup>/2/</sup>, (that addresses the PRCs and is also valid for the whole 2<sup>nd</sup> 7-year crediting period of the project activity) <sup>/2/</sup>.
- The latest version of the registered PDD valid for the currently expired 1<sup>st</sup> 7-year crediting period of the project activity (PDD version 4.0, dated 10/01/2013) <sup>/4/</sup>.
- The Ruling note "Rationale for rejection of PRC-0171-004" (CDM-PA0171-RULE01) <sup>/69/ 4</sup>
- The CDM baseline and monitoring methodology ACM0001 "Flaring or use of landfill gas" (version 13.0.0) <sup>/7/</sup>,
- The following CDM methodological tools, that the revised PDD refers to:
  - "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1) <sup>/13/</sup>
  - "Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion" (version 02) <sup>/15/</sup>
  - "Tool to calculate the emission factor for an electricity system" (version 04.0 <sup>/17/</sup>)
  - "Project emissions from flaring" (version 02.0.0) <sup>/12/</sup>
  - "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) <sup>/14/</sup>
  - "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) <sup>/21/</sup>
  - Combined tool to identify the baseline scenario and demonstrate additionality (version 06.0) <sup>/22/</sup>
  - Common practice (version 03.1) <sup>/24/</sup>
  - Emissions from solid waste disposal sites (version 08.0) <sup>/76/</sup>

#### Process of validation opinion for PRCs:

<sup>4</sup> As confirmed by the EPIC assessment team, the following statements have their content deemed correct and are appropriately added in the revised PDD <sup>/2/</sup> regarding the Ruling Note CDM-PA0171-RULE1 <sup>/69/</sup>:

*"The Ruling note CDM-PA0171-RULE01 was recently issued by the CDM-EB on 01/03/2018 as an outcome of the rejection by the CDM-EB of a previously submitted request of approval of post-registration changes for the project activity in September/2017 (incl. the occurred and yet to occur implementation of the electricity generation infrastructure in question as a permanent change in project design that represented addition of new GHG abatement measure). This particular Ruling note establishes the following in its item (d):*

*"The PP/DOE may wish to submit a post registration change to reflect the actual implementation of the project activity and continue claiming CERs from the landfill gas (LFG) capture and destruction (...)"*

*By following the content of the above-quoted text from the ruling note CDM-PA0171-RULE01, destruction of methane through combustion of LFG in set of internal combustion gas engines (with gradual/phased implementation schedule) as alternative/additional methane destruction devices for the project activity since July/2016 is added as a permanent change in the project design that does not represent extension/addition of GHG measures and/or technologies".*

The process for validation opinion for PRCs is an independent assessment performed by a DOE that is based on applicable and valid guidelines described in the latest version of the CDM-VVS-PA<sup>/1/</sup>. In addition to that, standard auditing techniques have been applied by the EPIC assessment team. As part of the performed validation assessment for PRCs, the EPIC assessment team initially performed a desk review on related documents, followed by the conduction of an on-site visit to the project site as well as performance of interviews with representative of the project participant Essencis Soluções Ambientais S.A. These actions were performed by the EPIC assessment team in order to confirm the correctness and appropriateness of information added in the revised PDD<sup>/2/</sup>. For all identified inconsistencies and lack of clarity, related findings (list of outstanding issues) are raised. The next steps are to close out the findings through direct communication with the project participant and receipt of updated version of the PDD<sup>/2/</sup> and/or supporting documents and finally preparing the Validation Opinion Report. As per EPIC assessment procedures, the draft version of the Validation Opinion Report undergoes a technical review by EPIC prior to its approval and submission to the CDM-EB.

*Validation opinion assessment conclusion and summary of its validation opinion:*

As part of the conducted validation assessment, 3 (three) Corrective Action Requests (CARs) and 1 (one) Clarification Request (CL) were raised by the EPIC assessment team. Since the raised CARs and CL were sufficiently and correctly addressed by the project participants through amendments in the revised PDD<sup>/2/</sup>, it is thus the EPIC opinion that the revised PDD (version 9.0, dated 20/07/2018)<sup>/2/</sup> for the CDM project activity “Caieiras landfill gas emission reduction”, appropriately and correctly addresses all PRCs that are summarized and assessed in this Validation Report by sufficiently meeting all applicable CDM rules and requirements for addressing PRCs.

It is relevant to note that while assessed post-registration changes require prior approval by the CDM-EB, the project participant Essencis Soluções Ambientais chose to submit an independent request for approval of post-registration changes (not as part of any CDM verification affected by such changes all monitoring periods starting after 01/07/2017)).

The EPIC assessment team highlights that a CER issuance request valid for the monitoring period from 01/01/2016 to 30/06/2016 (13<sup>th</sup> period verification for the project activity) was submitted to the CDM-EB after the conclusion of implementation and starting of operations of the post-registration changes that are assessed in this Validation Opinion Report (after 01/07/2016). It is relevant to note that, as confirmed by the EPIC assessment team, the monitoring period from 01/01/2016 to 30/06/2016 does not encompass and is not affected by the post-registration changes which are addressed in the revised PDD (version 9.0, dated 20/07/2018)<sup>/2/</sup> assessed in this Validation Opinion Report.

The Verification Report<sup>/26/</sup> for the monitoring period from 01/01/2016 to 30/06/2016 however includes a relevant clarification disclaimer about such particular situation involving post-registration changes for which conclusion of implementation and/or starting of operations are dated one day after the ending of such monitoring period. By taking into account the content of both such disclaimer, content of paragraphs 247 and 248 of the latest version of the CDM project standard for project activities (CDM-PS-PA) and content of paragraph 277 of the latest version of the CDM validation and verification standard for project activities (CDM-VVS-PA), it is the opinion of EPIC that requirements of these particular paragraphs of the CDM-PS-PA for addressing PRCs were appropriately met by both the project participant Essencis Soluções Ambientais S.A. and EPIC (as the DOE responsible for performing the verification assessment for the monitoring period from 01/01/2016 to 30/06/2016 and as DOE responsible for the PRC validation assessment this Validation Report is valid to).

The EPIC assessment team also confirms that, *inter alia* other relevant requirements, the project activity remains being eligible for the application of the CDM baseline and monitoring methodology ACM0001 (version 13.0.0)<sup>/7/</sup> + applicable methodological tools<sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup> and that the previously assessed and demonstrated additionality for the project activity is not undermined



by the assessed PRCs. EPIC thus recommends the CDM-EB to approve the PRCs addressed for the project activity.

## SECTION B. Validation team, technical reviewer and approver

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### 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	Interviews	Validation findings
1.	Team Leader / Technical Expert	EI	Ratton	Marco	EPIC - Central Office	X	X	X	X
2.	Auditor	IR	Govindarao	Vishnu	EPIC - Central Office	X	-	-	X

EI: External individual

IR: Internal resource

Demonstration how the appointed assessment team meets the competence required for the performance of the verification assessment is included in Appendix 2 of this Validation Opinion Report.

### B.2. Technical reviewer and approver of the validation report on PRCs

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 / Technical Expert	IR	Radhamadhavan	Vijayaraghavan	EPIC Sustainability Services Pvt. Ltd. - Central office
2.	Approver	IR	Sudheendra	Krishnachar	EPIC Sustainability Services Pvt. Ltd. - Central office

IR: Internal resource

Demonstration how the appointed technical reviewer and approver of the Validation Report meet the competence required for the performance of the verification assessment is included in Appendix 2 of this Validation Opinion Report.

## SECTION C. Means of validation

### C.1. Desk/document review

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A detailed and comprehensive document review was performed by the EPIC assessment team in order to assess the revised PDD <sup>/2/</sup> addressing the PRCs. Besides the revised PDD <sup>/2/</sup>, documents such as the applied CDM baseline and monitoring methodology ACM0001 (version 13.0.0) <sup>/7/</sup> + all applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup> and other associated documentation and references were also reviewed by the EPIC assessment team by *inter alia* applying standard auditing techniques in order to assess the quality and relevance of information provided. The performed document review encompassed the following:

- Review of the content of the Ruling note “Rationale for rejection of PRC-0171-004” (CDM-PA0171-RULE01) <sup>/69/</sup> issued by the CDM-EB on 01/03/2018 as an outcome of the rejection by the CDM-EB of a previously submitted request of approval of post-registration changes for the project activity in September/2017.
- Review of data and information made available in the revised PDD <sup>/2/</sup> in order to verify the correctness, credibility and interpretation of presented information;
- Cross checks between information provided in the revised PDD <sup>/2/</sup> and information from other sources (not limited to those elaborated or provided by the project participants);
- Reference to available information relating to other project based initiatives and/or technologies identical or similar to the one adopted by the project activity;
- Review, based on the applied CDM baseline and monitoring methodology ACM0001 (version 13.0.0) <sup>/7/</sup> + applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup> of the appropriateness/correctness of formulae, calculation approaches and monitoring approaches referred in the revised PDD <sup>/2/</sup>. Besides of the revised PDD <sup>/2/</sup>, the following documents were *inter alia* assessed:
  - The currently registered version of the PDD of the project activity that is valid for its 2<sup>nd</sup> 7-year crediting period (version 6.0, dated 17/05/2016) <sup>/3/</sup>
  - The latest version of the PDD valid for the expired 1<sup>st</sup> 7-year crediting period (version 4.0, dated 10/01/2013) <sup>/4/</sup>
  - Validation Report for the renewal of crediting period for the project activity (dated 24/09/2013) <sup>/10/</sup>
  - Validation Report for the registration of the project activity under the CDM (dated 12/12/2005) <sup>/32/</sup>
  - Verification Report <sup>/26/</sup> and Monitoring Report <sup>/25/</sup> for the last performed periodic verifications within the 2<sup>nd</sup> 7-year crediting period of the project activity (monitoring period from 01/01/2016 to 30/06/2016)
  - Relevant decisions, clarifications and guidance from the CMP and the CDM-EB
  - Relevant regional and national and sectoral policies dealing with waste management

A complete list of all documents reviewed or referred to in the course of the performed validation opinion assessment for PRCs is included in Appendix 3 of this Validation Opinion Report.

### C.2. On-site inspection

Duration of on-site inspection: 25/05/2017				
No.	Activity performed on-site	Site location	Date	Team member
1	Opening meeting for the on-site visit. During such initial meeting the assessment team was introduced, it was confirmed/outlined the objectives and scope of the on-site visit and it was confirmed the previously planned agenda for such visit. The representatives of the project participant Essencis Soluções Ambientais S.A. also introduced themselves and completed/signed the EPIC list of participants form for the on-site visit.	Project's data storage and control room	25/05/2017	Marco A. Ratton
2.	Visual inspection of the of the so-far installed 21 internal combustion gas engines in which LFG has been combusted since July/2016 + ancillary equipment and systems for the grid-connected electricity generation infrastructure located within the geographical limits of the UVS – Caieiras landfill (e.g. power substation, power generation control infrastructure (incl. a shared main supervisory control and data acquisition system (SCADA)), LFG treatment and cooling plant). Visual inspection of the backup captive off-grid electricity generator (fuelled by diesel) under operational status since July/2016 as part of the project activity. Confirmation of correctness of related project design description included in the revised PDD <sup>/2/</sup> .	Are within project infrastructure for combustion of collected LFG where the set of internal combustion gas engines is installed.	25/05/2017	Marco A. Ratton
3.	Visual inspection of related monitoring equipment (Programmable Logic Controller unit (PLC units), data acquisition and storage infrastructure (database) and monitoring instruments). Checking/confirmation of correctness and appropriateness of data processing and data recording by the project's monitoring infrastructure under its revised design configuration as well as correctness of related description of applicable monitoring requirements/procedures as included in the revised PDD <sup>/2/</sup> .	Are within project infrastructure for combustion of collected LFG	25/05/2017	Marco A. Ratton
4.	Closure meeting for the on-site visit. During such closure meeting the assessment team summarized the main observations and finding from the performed on-site visit and indicated the next steps for the validation opinion assessment.	Are within project infrastructure for combustion of collected LFG	25/05/2017	Marco A. Ratton
	Opening meeting for the on-site visit. During such initial meeting the assessment team was introduced, it was confirmed/outlined the objectives and scope of the on-site visit and it was	Project's data storage and control room	25/05/2017	Marco A. Ratton

	confirmed the previously planned agenda for such visit. The representatives of the project participant Essencis Soluções Ambientais S.A. also introduced themselves and completed/signed the EPIC list of participants form for the on-site visit.			
5.	Visual inspection of the grid-connected electricity generation infrastructure located within the geographical limits of the UVS – Caieiras landfill (incl. visual inspection of container-based modular engine-generator sets (with individual nameplate installed capacity of 1.4 MW for which each internal combustion gas engine represents the major component), power substation, power generation control infrastructure (incl. a shared main supervisory control and data acquisition system (SCADA)), LFG treatment and cooling plant Visual inspection of the installed backup captive off-grid electricity generator (fuelled by diesel). Confirmation of correctness of related project design description included in the revised PDD <sup>/2/</sup> .	Are within project infrastructure for combustion of collected LFG where the set of internal combustion gas engines is installed.	25/05/2017	Marco A. Ratton
6.	Visual inspection of related monitoring equipment (Programmable Logic Controller unit (PLC units), data acquisition and storage infrastructure (database) and monitoring instruments) for the project activity under its revised design configuration. Checking/confirmation of correctness and appropriateness of data processing and data recording by the project's monitoring infrastructure under its revised design configuration as well as correctness of related description of applicable monitoring details included in the revised PDD <sup>/2/</sup> .	Are within project infrastructure for combustion of collected LFG	25/05/2017	Marco A. Ratton
7.	Closure meeting for the on-site visit. During such closure meeting the assessment team summarized the main observations and finding from the performed on-site visit and indicated the next steps for the validation opinion assessment.	Are within project infrastructure for combustion of collected LFG	25/05/2017	Marco A. Ratton

### C3 Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Silva	Leandro Gonçalves	Essencis Soluções	25/05/2017	Personal (face-to-face) interview encompassing the	Marco A. Ratton

2.	Barbosa	(Mr.)  Nuno	Ambientais S.A.  UniCarbo - Energia e Biogás Ltda. <sup>5</sup>	25/05/2017 and 23/10/2017	<p>following topics:</p> <ul style="list-style-type: none"> <li>- General implementation and operational aspects of the project activity (under its revised design configuration);</li> <li>- General aspects about the gradual/phased installation of a set of internal combustion gas engines as additional/alternative methane destruction devices as part of the project activity including: <ul style="list-style-type: none"> <li>o Specification of related equipment</li> <li>o Time plan</li> <li>o Financials and economics</li> <li>o Correctness and appropriateness of related information details included in the revised PDD<sup>/2/</sup> and their compliance with applicable CDM rules</li> </ul> </li> <li>- General technical aspects about related permanent changes in the monitoring plan of the project activity, including: <ul style="list-style-type: none"> <li>o Specification of related monitoring equipment/instruments</li> <li>o Time plan of implementation of additional monitoring equipment/instruments</li> <li>o Correctness and appropriateness of related information details included in the revised PDD<sup>/2/</sup> and their compliance with applicable CDM</li> </ul> </li> </ul>	
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<sup>5</sup> As confirmed by the EPIC assessment team during performed interviews, UniCarbo Energia e Biogás Ltda. is a CDM consulting and advisory service company that has supported the host-country project participant Essencis Soluções Ambientais S.A. with CDM related issues for the project activity (*inter alia* completion of the revised PDD<sup>/2/</sup>). This CDM consulting and advisory service company is confirmed as not being a project participant.

					<p>rules</p> <p>General technical aspects about details for the correction in information (that do not affect the project design) as per the revised PDD <sup>/2/</sup> including correctness and appropriateness of texts added in the revised PDD <sup>/2/</sup> and their compliance with applicable CDM rules</p>	
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#### C.4. Sampling approach

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Not applicable. No sampling approach is used for the validation assessment of post-registration changes (incl. on-site inspection).

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

Areas of validation findings	No. of CL	No. of CAR	No. of FAR
Compliance with PDD form	0	0	0
Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines	n/a	n/a	n/a
Corrections	0	0	0
Changes to the start date of the crediting period	n/a	n/a	n/a
Inclusion of a monitoring plan	n/a	n/a	n/a
Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools		CAR 1 CAR 3	0
Changes to the project design	CL 1	CAR 2	0
Changes specific to afforestation and reforestation project activities	n/a	n/a	n/a
Others (please specify)	0	0	0
<b>Total</b>	<b>1</b>	<b>3</b>	<b>0</b>

### SECTION D. Validation findings

#### D.1. Compliance with PDD form

<b>Means of validation</b>	<p>In accordance with applicable requirements of the CDM-VVS-PA (version 01.0) <sup>/17/</sup>, the EPIC assessment team assessed and evaluated the completion of the revised PDD <sup>/2/</sup> addressing the PRCs in order to <i>inter alia</i> determine whether such revised PDD was completed by correctly applying a valid version of the CDM-PDD form (and by correctly following all applicable guidance for its completion) as well as providing all necessary information and documentation to demonstrate compliance of the CDM project activity (under its revised design configuration) with all applicable rules and requirements (e.g. CDM project standard for project activities (CDM-PS-PA) <sup>/18/</sup> and other applicable rules and requirements).</p> <p>The EPIC assessment team assessed and evaluated whether the description of the project activity (under its revised design configuration) in the revised PDD provides an understanding of its nature and implementation.</p> <p>In this particular PRC assessment context, the EPIC assessment team also assessed whether information (text elements) transferred from the currently registered version of the PDD valid for the 2<sup>nd</sup> 7-year crediting period (version 6.0, dated 17/05/2016) <sup>/3/</sup> to the revised PDD <sup>/2/</sup> is materially the same (excluding information context related to the occurred and yet to occur (planned) PRCs).</p> <p><b>D.1.1 – General assessment for the completion of the revised PDD:</b></p>
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	<p>The EPIC assessment team verified that the revised PDD (made available in both clean <sup>/2/</sup> and tracked changes <sup>/4/</sup> versions) were completed by the project participant Essencis Soluções Ambientais S.A. by correctly applying the latest version of the CDM-PDD form (version 10.1) <sup>/20/</sup> (with all applicable guidance for its completion being sufficiently and appropriately followed).</p> <p>Applicable guidance and requirements for completing the CDM-PDD form (version 10.1) <sup>/20/</sup> (as established by its attachment “Instructions for completing this form”) were confirmed by the EPIC assessment team as being correctly and sufficiently considered for the completion of the revised PDD <sup>/2/</sup>.</p> <p>Relevant rules and requirements as per the CDM project standard for project activities (CDM-PS-PA) <sup>/18/</sup> were also confirmed to be met/followed in the completed revised PDD <sup>/2/</sup>.</p> <p>While the currently registered version of the PDD valid for the 2<sup>nd</sup> 7-year crediting period (version 6.0, dated 17/05/2016) <sup>/3/</sup> was completed by applying a previous version of the CDM-PDD form (version 06.0); all information included in the revised PDD <sup>/2/</sup> is materially the same as information available in the currently registered version of the PDD (with exception of information content related to the assessed PRCs) as confirmed by the EPIC assessment team.</p> <p>Information content made available in the revised PDD <sup>/2/</sup> addressing the post-registration changes includes description and objective of the project activity (under its revised design configuration), information regarding the validity of the previously determined baseline scenario for methane emissions, definition of baseline scenario for electricity generation, definition of the project boundary for the project activity (under its revised design configuration), sources and GHGs, demonstration of non-undermining of previously assessed additionality of the project activity, estimates of GHG emission reductions to be achieved during the 2<sup>nd</sup> 7-year crediting period by the project activity (under its revised design configuration), revised monitoring plan, corrections (in information that do not affect the project design) etc.).</p> <p>While both the currently registered version of the PDD valid for the 2<sup>nd</sup> 7-year crediting period <sup>/3/</sup> and the revised PDD <sup>/2/</sup> apply the same CDM baseline and monitoring methodology + the same applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/</sup> (with exception of the application of the latest version of the methodological tool “Common practice” (version 03.1) <sup>/24/</sup> (that is applied only in the revised PDD <sup>/2/</sup> for the demonstration of non-undermining of additionality and determination of the baseline scenario of the project activity under its revised design configuration), the EPIC assessment team was able to confirm that sections of the revised PDD <sup>/2/</sup> were appropriately updated through transferring of significant amount information elements from currently registered version of the PDD valid for the 2<sup>nd</sup> 7-year crediting period <sup>/3/</sup>.</p> <p>In summary, the EPIC assessment team was able to confirm that the revised PDD <sup>/2/</sup> is correctly completed and provides clear understanding of the project activity design and monitoring as well as the assessed PRCs.</p>
<b>Findings</b>	<p>No CARs and/or CLs were raised regarding the completion of the revised PDD for the 2<sup>nd</sup> 7-year crediting period <sup>/2/</sup> under conformance with application of a valid/latest version of the CDM-PDD form and applicable guidance for its completion.</p>
<b>Conclusion</b>	<p>In summary, the EPIC assessment team was able to confirm that the revised PDD <sup>/2/</sup> addressing the assessed PRCs (made available in both clean and tracked changes versions) was completed by correctly applying the latest version of the CDM-PDD form (version 10.1) <sup>/20/</sup> (with all applicable guidance for its completion being sufficiently followed).</p> <p>It is also the opinion of the EPIC assessment team that the revised PDD <sup>/2/</sup> provides clear understanding of the project activity (under its revised design configuration) and its monitoring, including clear description of all assessed PRCs.</p>

## D.2. Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines

<b>Means of validation</b>	Not applicable. No temporary deviations from the registered monitoring plan are encompassed by the performed validation assessment for PRCs.
<b>Findings</b>	Not applicable. No temporary deviations from the registered monitoring plan are encompassed by the performed validation assessment for PRCs.
<b>Conclusion</b>	Not applicable. No temporary deviations from the registered monitoring plan are encompassed by the performed validation assessment for PRCs.

## D.3. Corrections

<b>Means of validation</b>	<p>In accordance with applicable requirements of the CDM-VVS-PA (version 01.0) <sup>/1/</sup>, the EPIC assessment team assessed and evaluated performed corrections (in information that do not affect the project design) implemented in the revised PDD <sup>/2/</sup> addressing PRCs in order to <i>inter alia</i> determine whether such performed corrections are under full compliance with applicable CDM rules and requirements for addressing this particular category of PRCs.</p> <p><b>D.3.1 - General description of the performed Corrections (that do not affect the project design):</b></p> <p>In the context of the elaboration of the revised PDD <sup>/2/</sup> (of which, as declared by the interviewed representatives of the project participant, was primarily compiled in order to address the permanent changes in the project design and permanent changes in the monitoring plan), the opportunity for correcting previously existent/detected minor errors and mistakes as available in the currently registered version of the PDD valid for the 2<sup>nd</sup> 7-year crediting period (version 6.0, dated 17/05/2016) <sup>/3/</sup> was taken by the project participant Essencis Soluções Ambientais S.A. This is deemed reasonable and acceptable in the opinion of EPIC.</p> <p>The performed Corrections (in information that do not affect the project design) are related to the general description of the project activity and ex-ante estimates of emission reductions to be achieved by the project activity during its 2<sup>nd</sup> 7-year crediting period. Moreover, as appropriately argued by the representatives of the project participant, the application of the latest version of the CDM-PDD form (version 10.1) <sup>/20/</sup> also required additional corrections and improvements to be implemented in the revised PDD in order to have such revised PDD fully meeting all applicable requirements for the completion of such latest version of the CDM-PDD form <sup>/20/</sup> (as established by its attachment "Instructions for completing this form").</p> <p>As verified by the EPIC assessment team, the performed Corrections (in information that do not affect the project design) are summarized as follows (as correctly outlined in Appendix 7 of the revised PDD <sup>/2/</sup>:</p> <p><i>"Corrections (that do not affect the project design):</i></p> <ul style="list-style-type: none"> <li>- <i>General text and terminology revision of project description in order to fully comply with the currently applicable requirements for completing the CDM-PDD form (version 10.1) (as established by its attachment "Instructions for completing this form") and to enhance/improve the project design description.</i></li> <li>- <i>Minor text improvements (incl. review of statements and correction of previously existent typographic mistakes) in order to improve the overall project description.</i></li> <li>- <i>Revision of ex-ante estimates of emission reductions to be achieved by the project activity during its 2<sup>nd</sup> 7-year crediting period (by inter alia taking</i></li> </ul>
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into account the determination of project emissions due to consumption of electricity by the project activity through application of Scenario C of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 01)).

- The name of the landfill hosting the project activity is changed from "CTR Caieiras landfill" to "UVS - Caieiras landfill" reflecting the occurred change in early 2017 of the designation of the landfill hosting the project activity that was made by the project participant and project owner Essencis Soluções Ambientais S.A. as part of the operationalization of the company's commercial, marketing and sustainability strategy.
- Updated contact information details for the project participant Essencis Soluções Ambientais S.A. is added (in line with the latest version of the completed Modalities of Communication (MoC) form for the project activity).
- Details about performed task-force involving capital and labor intensive maintenance, repair and parts replacement work in existing project's LFG collection infrastructure and operational improvements for such infrastructure held during the period from July/2016 to July/2017 are added in Section A.3.

#### **D.3.2 - Assessment of the performed Corrections (that do not affect the project design):**

The EPIC assessment team confirmed that the performed general text revisions of the project description are in full accordance with the revised project design and applicable CDM rules for completing the CDM-PDD form (version 10.1) <sup>/20/</sup>.

The performed revision of ex-ante estimates of emission reductions (by inter alia taking into account the determination of project emissions due to consumption of electricity by the project activity through application of Scenario C of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 01) <sup>/13/</sup>) is made on the basis of utilization of conservative 1.3 tCO<sub>2</sub>/MWh value for the CO<sub>2</sub> emission factor of electricity consumed by the project activity as per provision valid for Case C.III of the tool. Moreover, the value for monitoring parameter Operation margin CO<sub>2</sub> emission factor in year y ( $EF_{grid,OM,y}$ ) = Dispatch data analysis operating margin CO<sub>2</sub> emission factor in year y ( $EF_{grid,OM-DD,y}$ ) was updated also in the context of ex-ante estimates of emission reductions. As confirmed by the EPIC assessment team, selected value for  $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$  represents the applicable value for the National Electricity Grid of Brazil for year 2017, thus replacing the value applicable for year 2012 as applied in the currently registered version of the PDD. The selected annual value of  $EF_{grid,OM,y} = EF_{grid,OM-DD,y}$  valid for year 2017 of 0.5882 tCO<sub>2</sub>/MWh was also confirmed by the EPIC assessment team as representing the value officially reported by the DNA of Brazil in its website <sup>/27/</sup>.

Furthermore, as also confirmed by the EPIC assessment team, the selected value of 1.3 tCO<sub>2</sub>/MWh for the CO<sub>2</sub> emission factor of electricity consumed by the project activity was correctly applied in the context of estimates of project emissions due to the consumption of electricity along the 7-year crediting period.

As also confirmed by the EPIC assessment team, the value of annual ex-ante estimates of baseline emissions for electricity ( $BE_{EC,y}$ ) applicable for year 2020 was also correctly determined by taking into account the number of days encompassed by this last year of the 2<sup>nd</sup> 7-year crediting period.

Values for ex-ante estimates of annual GHG emission reductions to be achieved by the project activity along the 2<sup>nd</sup> 7-year crediting period were corrected in Section B.6.3 of the revised PDD <sup>/2/</sup>.

Related calculations of ex-ante estimates of emission reductions to be achieved by the project activity during the 2<sup>nd</sup> 7-year crediting period were also appropriately corrected as outlined in the revised version of the emission reduction calculation spreadsheet <sup>/2/</sup> and as summarized below:

Year	Annual ex-ante estimates of baseline emissions for methane (BE <sub>y</sub> ) (tCO <sub>2</sub> e)	Annual ex-antes estimates of Project emissions due to consumption of electricity by the Project activity (PE <sub>EC,y</sub> )
2013	49,271	403
2014	1,025,871	7,748
2015	1,100,391	7,748
2016	1,170,870	7,748
2017	1,237,972	7,748
2018	1,302,258	7,748
2019	1,364,204	7,748
2020	351,177	1,911
Total	7,602,014	48,805

Year	Annual ex-ante estimates of emission reductions to be achieved by the project activity (ER <sub>y</sub> ) (in tCO <sub>2</sub> e)
2013	48,868
2014	1,018,120
2015	1,092,640
2016	1,163,119
2017	1,230,221
2018	1,294,507
2019	1,356,453
2020	349,265
Total	7,553,194
Annual average of the estimated reductions over the crediting period (tCO <sub>2</sub> e) <sup>6</sup>	1,199,180

As part of the conducted on-site visit to the project's infrastructure, the result of the performed task-force involving capital and labor intensive maintenance, repair and parts replacement work within the project's LFG collection infrastructure held during the period from July/2016 to July/2017 could be confirmed by the EPIC assessment team as being correctly and appropriately reported in the revised PDD <sup>/2/</sup>. Furthermore, the promoted operational improvements for project's LFG collection infrastructure also held during the period from July/2016 to July/2017 were confirmed by the EPIC assessment team as implemented under conformance with details presented in Box 2b in section A.3 of the revised PDD <sup>/2/</sup>. It is the opinion of the EPIC assessment team that inclusion of related information in the revised PDD enhances the comprehension of the project operation and its design description.

It is the opinion of the EPIC assessment team that the inclusion of details about such performed task-force work (involving capital and labor intensive maintenance, repair and parts replacement) in existing project's LFG collection infrastructure + the performed operational improvements for such infrastructure in section A.3 of the revised PDD <sup>/2/</sup> also enhances the comprehension of the dynamics of the operation of the project activity and also provides the reader a transparent overview of more recent efforts from the project participant Essencis Soluções Ambientais S.A. for achieving quantitative and qualitative improvements for collected LFG.

<sup>6</sup> The following disclaimer is appropriately added in the revised PDD <sup>/2/</sup> regarding the calculated value for annual average of estimated emission reductions to be achieved by the project activity (under its revised design configuration) along the 2<sup>nd</sup> 7-year crediting period:

*"The annual average of the estimated reductions over the crediting period is calculated (as a function of the total emission reductions estimated for the whole 2<sup>nd</sup> crediting period) by taking into account that, as a result of the previously performed activities for its renewal, the length of project's 2nd crediting period encompassing 2,299 days is slightly shorter than 7 full years (2,555 days)."*

	<p>As also confirmed by the EPIC assessment team, the fantasy name of the landfill hosting the project activity is indeed changed from “CTR Caieiras landfill” to “UVS - Caieiras landfill”. As explained by the representatives of the project participant Essencis Soluções Ambientais S.A. the occurred landfill name/designation in year 2017 was motivated by occurred changes/improvements in the company's commercial, marketing and sustainability strategy. A publically available company movie <sup>/62/</sup> issued by Essencis Soluções Ambientais S.A. referring to the new “UVS - Caieiras landfill” was made available and watched by the EPIC assessment team. Finally, the EPIC assessment team also confirmed that contact information details for the project participant Essencis Soluções Ambientais S.A. were also correctly updated in Appendix 1 of the revised PDD <sup>/2/</sup> (under conformance with details included the latest version of the completed Modalities of Communication (MoC) form for the project activity <sup>/23/</sup>).</p> <p>In general, as verified by the EPIC assessment team, the performed corrections in information (that do not affect the project design) enhance the project design description and ensure the correct and complete completion of the revised PDD <sup>/2/</sup> applying the CDM baseline and monitoring methodology ACM0001 (version 13.0.0) <sup>/7/</sup> + applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup>.</p>
<b>Findings</b>	No findings were raised regarding the performed Corrections (that do not affect the project design) in the revised PDD for the 2 <sup>nd</sup> 7-year crediting period <sup>/2/</sup> .
<b>Conclusion</b>	It is the opinion of the EPIC assessment team that the description of the performed Corrections (in information that do not affect the project design) is correctly and sufficiently described in the revised version of PDD <sup>/2/</sup> .

#### D.4. Changes to the start date of the crediting period

<b>Means of validation</b>	Not applicable. No changes to the start date of the crediting period as per the initially registered version of the PDD valid for the 2 <sup>nd</sup> 7-year crediting period <sup>/3/</sup> have occurred.
<b>Findings</b>	Not applicable.
<b>Conclusion</b>	Not applicable.

#### D.5. Inclusion of a monitoring plan

<b>Means of validation</b>	Not applicable. The monitoring plan for the project activity (under its previous design configuration <sup>7</sup> ) was previously described in the currently registered version of the PDD valid for the 2 <sup>nd</sup> 7-year crediting period (version 6.0, dated 17/05/2016) <sup>/3/</sup> and its correctness and compliance with the applied baseline and monitoring methodology ACM0001 (version 13.0.0) <sup>/7/</sup> was assessed by the DOE which performed the validation assessment for the renewal of crediting period of the project activity. The monitoring plan for the project activity (under its permanently revised design configuration) is described in the revised PDD valid for the 2 <sup>nd</sup> 7-year crediting period <sup>/2/</sup> and it is assessed in Section D.6 below.
<b>Findings</b>	Not applicable.
<b>Conclusion</b>	Not applicable.

<sup>7</sup> The term “project activity under its previous design configuration” is appropriately outlined in the revised PDD <sup>/2/</sup> as representing the implementation and operation during the period from February/2007 to July/2016 of a LFG collection + destruction (by flaring) infrastructure without the promotion of any utilization of collected LFG.

**D.6. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools**

<p><b>Means of validation</b></p>	<p>In accordance with applicable requirements of the CDM-VVS-PA (version 01.0) <sup>/1/</sup>, the EPIC assessment team assessed and evaluated performed permanent changes from the registered monitoring plan of the project activity as reported in the revised PDD <sup>/2/</sup> addressing PRC in order to <i>inter alia</i> determine whether such performed changes are under compliance with applicable procedural and methodological CDM rules and requirements for addressing PRCs under this category.</p> <p><b>D.6.1 - General description of the performed changes from the registered monitoring plan:</b></p> <p>As further explained and assessed in Section D.7 under the description and assessment of the permanent post-registration changes in the project design, the installation of a set of internal combustion gas engines as additional/alternative methane destruction devices for the project activity and the installation of a new backup captive off-grid electricity generator (fuelled by diesel) represent permanent changes that demand modifications in terms of the required ex-post monitoring approach for the determination of achieved GHG emission reductions as a result of operation of the project activity (under its revised design configuration). In this context, as confirmed by the EPIC assessment team, the revised PDD <sup>/2/</sup> correctly and appropriately incorporates changes both in its monitoring plan and described GHG calculation approaches that made the monitoring plan of the project activity deemed suitable for the changes in its design and, at the same time, fully meeting all applicable monitoring requirements as per ACM0001 (version 13.0.0) <sup>/7/</sup> + applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup>.</p> <p>The changes in the monitoring plan are summarized as follows (as correctly outlined in Appendix 7 of the revised PDD <sup>/2/</sup>):</p> <ul style="list-style-type: none"> <li>• <i>Permanent changes from the registered monitoring plan:</i> <ul style="list-style-type: none"> <li>- <i>Revision of the applied monitoring and GHG calculation approaches by including additional monitoring requirements and calculation approaches for determining the following emissions as a result of the changes in the project design:</i> <ul style="list-style-type: none"> <li>(iii) <i>Baseline emissions for methane (due to destruction of LFG (rich in methane) also occurring in the set of internal combustion gas engines (regarded as additional/alternative methane destruction devices).</i></li> <li>(iv) <i>Project emissions (due to the consumption of electricity sourced by the installed backup captive off-grid electricity generator (fuelled by diesel)).</i>  <i>Project emissions due to consumption of electricity (sourced by the grid or backup generator (fuelled by diesel)) by the project activity will be determined by applying guidance of Scenario C of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) to these sources of electricity consumption.</i></li> </ul> </li> </ul> </li> </ul> <p><i>As a result of the related revision of the applied GHG calculation and monitoring approaches, additional ex-ante determined parameters and parameters monitored ex-post are added (i.e. <math>Op_{j,h}</math>, <math>EF_{EL,captive,y}</math>, <math>EF_{EL,grid,y}</math>, <math>EC_{PJ,captive,y}</math>, <math>FC_{Diesel,y}</math>, <math>NCV_{Diesel,y}</math>, <math>EF_{CO2,Diesel,y}</math>, <math>EG_{Diesel-Generator,y}</math> and <math>TDL_{captive,y}</math>) and the parameter <math>TDL_{grid,y}</math> will be monitored ex-post (as established by the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption").</i></p> <p><i>Assessment of the occurred full revision of the applied monitoring and calculation</i></p>
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*approaches in order to add additional monitoring requirements and calculation approaches for determining baseline and project emissions as a result of occurred and yet to occur permanent changes in the project design:*

The general description of the revised monitoring plan (in order to add additional monitoring requirements and calculation approaches for determining baseline and project emissions as a result of the permanent changes in the project design as presented in the revised PDD <sup>/2/</sup>) was confirmed by the EPIC assessment team as being under full conformance with applied CDM baseline and monitoring methodology (ACM0001 (version 13.0.0) <sup>/1/</sup>) + applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup>.

Through the performance of an on-site visit to the project activity, the EPIC assessment team was also able to confirm that the revised monitoring plan is currently physically implemented under conformance with related details for the project's monitoring system as outlined in the revised PDD <sup>/2/</sup>.

Thus, it is the opinion of the EPIC assessment team that the revised monitoring plan will give opportunity for real, effective and correct measurements and monitoring of emission reductions to be achieved by the project activity (under its revised design configuration) along the remaining share of its 2<sup>nd</sup> 7-year crediting period.

General details of measurement data to be collected, frequency of data recording, requirements in terms of maintenance and operation of monitoring instruments/equipment (including performance of calibration events) as well as the general project management responsibilities are all clearly defined in the revised monitoring plan as outlined in the revised PDD <sup>/2/</sup>.

It is the opinion of the EPIC assessment team that the operationalization of the revised monitoring plan, as described in the revised PDD <sup>/2/</sup>, is feasible for the project's operation. By also taking into approach the revised GHG calculation and monitoring procedure for determining project emissions due to the consumption of electricity by the project activity added in the revised PDD <sup>/2/</sup> (approach applying guidance of Scenario C of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) <sup>/13/</sup> to existent sources of electricity consumption under Case C.III), the content of the revised PDD will allow complete and correction determination of both baseline and project emissions of the project activity (under its revised design configuration).

As also indicated in the revised PDD <sup>/2/</sup>, an appropriate and revised project's operational and management structure was confirmed by EPIC as being previously defined and implemented in order to address the occurred and yet to occur (planned) gradual/phased implementation of the project's new electricity generation infrastructure in terms of monitoring. Such revised project's operational and management structure relies on staff with responsibilities clearly defined; where all collaborators, employees and contractors involved with operation and/or monitoring of project activity (under its revised design configuration) have all received appropriate training.

As also outlined in the revised PDD <sup>/2/</sup>, additional training of project's operational and management staff encompasses general competence development about LFG utilization; review of equipment operational principles and captors; maintenance and calibration requirements for related equipment/instruments for the project's new electricity generation infrastructure; procedures for monitoring data gathering and handling as well as emergency and safety procedures also applicable for the project's new electricity generation infrastructure.

In summary, the revision of the monitoring plan sufficiently makes the monitoring system of the project activity under full compliance/conformity with its revised design configuration encompassing extension of technology (i.e. incl. utilization of collected LFG as gaseous fuel for electricity generation and incl. backup captive off-grid electricity generator (fuelled by diesel)).

### D.6.2 - Assessment of the performed changes from the registered monitoring plan:

Additional ex-ante determined parameters and parameters to be monitored *ex-post* are correct added in the revised PDD <sup>/2/</sup> as required by ACM0001 (version 13.0.0) <sup>/7/</sup> and the following applicable methodological tools:

- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1) <sup>/13/</sup>
- "Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion" (version 02) <sup>/15/</sup>
- "Tool to calculate the emission factor for an electricity system" (version 04.0 <sup>/17/</sup>)
- "Project emissions from flaring" (version 2.0.0) <sup>/12/</sup>
- "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) <sup>/14/</sup>

The revised PDD <sup>/2/</sup> correctly includes in its Section B.6.2 details about the following additional ex-ante determined parameters (fixed *ex-ante* along the 2<sup>nd</sup> 7-year renewable crediting period) (for which assessment is also included in the table below):

Parameter	Unit	Value(s) applied	Source of used data
CO <sub>2</sub> emission factor for electricity sourced by the captive off-grid electricity generators (EF <sub>EL,captive,y</sub> )	tCO <sub>2</sub> /MWh	1.3	Selected value correctly corresponds to the conservative default value valid for Case C.III, option B.2 as per applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" <sup>/13/</sup>
CO <sub>2</sub> emission factor for grid-sourced electricity in year y (EF <sub>EL,grid,y</sub> )	tCO <sub>2</sub> /MWh	1.3	Selected value correctly corresponds to the conservative default value valid for Case C.III, option B.1 as per applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" <sup>/13/</sup>

The revised monitoring plan of the project activity, as outlined in the revised PDD <sup>/2/</sup>, also correctly includes in its Sections B.7.1 and B.7.2 correct and sufficient monitoring details for the following additional parameters of which *ex-post* post monitoring along the remaining share of the 2<sup>nd</sup> 7-year crediting period is required by taking into account the permanent changes in the design of the project activity. The following ex-post monitored parameters were added in the revised PDD (for which assessment is also included in the table below):

Parameter	Unit	Instrument	Assessment of measuring/recording frequency
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	Operation of the equipment that consumes LFG (i.e. internal combustion gas engines (as additional/alternative methane destruction devices)) ( $Op_{j,h}$ )	-	-	As established by ACM0001 (version 13.0.0) <sup>/1/</sup> , for each equipment unit $j$ that represents additional/alternative methane destruction devices for the project activity (each internal combustion gas engine), it will be monitored if each underlying equipment (element) has operated in hour $h$ . As appropriately outlined in the revised PDD <sup>/2/</sup> , monitoring of the operational status/conditions of each one of the internal combustion gas engines may be made inter-alia through monitoring of the amount electricity generated by the electricity generation infrastructure (for which the set of engines represents major components) on an individual or aggregated basis on each hour $h$ . Moreover, the operational status of each individual internal combustion gas engines will be monitored for each hour $h$ .
	Quantity of electricity generated in captive diesel backup generator during the year $y$ ( $EC_{PJ,captive,y}$ )	MWh	Electricity meter(s)	Measurements performed by appropriate electricity meter(s) will be aggregated manually or automatically. Accumulated measurement records will be reported with at least every-month frequency.
	Quantity of fuel diesel combusted by the captive off-grid electricity generator ( $FC_{Diesel,y}$ )	Liters	Flow meters or volume meters. (As an alternative measurements will be based on records of an integrated electronic system of the generator, which shows the percentage of stored fuel)	Monitoring will be made weekly, recording the operating hours and the percentage of fuel load of equipment, considering the specific fuel consumption specified by the equipment manufacturer.
	Net calorific value of the fuel diesel in year $y$ ( $NCV_{Diesel,y}$ )	GJ/liters	-	Value provided by the fuel supplier in invoices, regional or national default values or IPCC default values (at upper limit of uncertainty at 95% confidence interval as provided in Table 1.2 of

				<p>Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. Any future revision of the IPCC Guidelines will be taken into account.</p> <p>If the diesel supplier does provide related NCV values and CO<sub>2</sub> emission factor for the delivered fuel on the invoice and these two values are based on measurements for this specific fuel, this source will be used for the determination of values for the monitoring parameter NCV<sub>Diesel,y</sub>. In case, another source(s) for the values is/are applied, regional or national default values or IPCC default values will thus be considered.</p>
	CO <sub>2</sub> emission factor of fuel diesel in year y (EF <sub>CO2,Diesel,y</sub> )	tCO <sub>2</sub> /GJ	-	<p>Value provided by the fuel supplier in invoices, regional or national default values or IPCC default values (at upper limit of uncertainty at 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories). Appropriate net calorific value (NCV) for Diesel may be used for converting energy basis data into mass basis data.</p> <p>In case values are provided by the fuel supplier in invoices, the applied weighted average annual value will be determined based on provided related information in the context of each individual fuel delivery event.</p> <p>In case regional or national default values or IPCC default values are considered an every year monitoring frequency is applied.</p>
	Quantity of electricity generated in captive diesel backup generator during the year y (EG <sub>Diesel-Generator,y</sub> )	MWh	Appropriate electricity meter(s).	Measurements will be aggregated manually or automatically. Accumulated measurement records will be reported at with at least every-month frequency.



	Average technical transmission and distribution losses for electricity sourced by the captive electricity generator. ( $TDL_{captive,y}$ )	-	-	Value will be determined through the use of recent, accurate and reliable data available within the host country or through selection of the applicable default value as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) <sup>/13/</sup> .
	Average technical transmission and distribution losses for providing electricity to the grid and/or for grid sourced electricity consumed by the project activity. ( $TDL_{grid,y}$ )	-	-	Value will be determined through the use of recent, accurate and reliable data available within the host country or through selection of the applicable default value as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) <sup>/13/</sup> . While as per the currently registered version of the PDD, $TDL_{grid,y}$ is included as a ex-ante selected parameter, as per the revised project design configuration and considered approach for the determination of project emissions, $TDL_{grid,y}$ will be monitored ex-post (as established by the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" <sup>/13/</sup> ).
<p>The EPIC assessment team confirmed that, besides the above-quoted monitoring parameters which were included in the monitoring plan of the project activity, the revised PDD <sup>/2/</sup> also includes a revision of the description and monitoring aspects of the following monitoring parameters (due to the inclusion of the set of internal combustion gas engines as additional/alternative methane destruction devices for the project activity):</p> <ul style="list-style-type: none"> <li>- Volumetric flow of LFG stream in time interval <math>t</math> on a wet basis for <math>j</math> (where <math>j</math> is the LFG delivery pipeline to each internal combustion gas engine or the LFG delivery pipeline to each high temperature enclosed flare) (<math>V_{t,wb,j}</math>)</li> <li>- Volumetric flow of LFG stream in time interval <math>t</math> on a dry basis for <math>j</math> (where <math>j</math> is the LFG delivery pipeline to each internal combustion gas engine or the LFG delivery pipeline to each high temperature enclosed flare) (<math>V_{t,db,j}</math>)</li> <li>- Volumetric fraction of <math>CH_4</math> in the collected LFG in time interval <math>t</math> on a dry basis for <math>j</math> (where <math>j</math> is the LFG delivery pipeline to each internal combustion gas engine or the LFG delivery pipeline to each high temperature enclosed flare) (<math>V_{CH_4,t,db}</math>)</li> <li>- Volumetric fraction of <math>CH_4</math> in the collected LFG in time interval <math>t</math> on a wet basis for <math>j</math> (where <math>j</math> is the LFG delivery pipeline to each internal combustion gas</li> </ul>				

engine or the LFG delivery pipeline to each high temperature enclosed flare) ( $V_{CH_4,t,wb}$ )

- Mass flow of the LFG stream in time interval  $t$  on dry basis for  $j$  (where  $j$  is the LFG delivery pipeline to each internal combustion gas engine or the LFG delivery pipeline to each high temperature enclosed flare) ( $M_{t,db}$ )

In summary, the selection of the additional parameters monitored *ex-post* and their monitoring procedures as per the performed revision of the monitoring plan of the project activity (as outlined in the revised PDD <sup>/2/</sup>), are deemed complete, transparent and in accordance with applicable requirements of the applied CDM baseline and monitoring methodology ACM0001 (version 13.0.0) <sup>/7/</sup> and applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup>.

### D.6.3 - Assessment of performed revisions to algorithms and formulae used for the determination of emission reductions

Due to the gradual/phased addition of a set internal combustion gas engines as additional/alternative methane destruction devices for the project activity (with the design of project activity not encompassing electricity generation as an additional GHG abatement measure (where methane destruction remains as the unique measure for the project activity), selected algorithms and formulae used for the determination of emission reductions achieved by the project activity were correctly revised accordingly. This section includes the EPIC assessment for the changes made in Section B.6.1 of the PDD.

#### *Assessment of determination of baseline emissions ( $BE_y$ ):*

As per the revised project design configuration, baseline emissions remains being determined as follows:

$$BE_y = BE_{CH_4,y}$$

Where:

$BE_{CH_4,y}$  Baseline emissions of methane from the SWDS in year  $y$  (in  $tCO_2e/yr$ )

*Assessment of ex-post determination of "Amount of methane which is destroyed by the project activity through combustion of collected LFG in project's methane destruction devices in year  $y$ " ( $F_{CH_4,PJ,y}$ ) / Assessment of determination of "Amount of methane which is destroyed through combustion of collected LFG in the flares in year  $y$ " ( $F_{CH_4,EL,y}$ ):*

By correctly taking into account that as per the revised project design configuration, methane is also sent to the project's new electricity generation infrastructure as part of the operation of the project activity during the remaining share of the 2<sup>nd</sup> 7-year renewable crediting period,  $F_{CH_4,PJ,y}$  will thus be ex-post determined (in  $tCH_4/year$ ) as the sum of the quantity of methane flared and quantity of methane used as gaseous fuel in the project's new electricity generation infrastructure. This is correctly addressed in Section B.6.1 of the revised PDD <sup>/2/</sup> through revision of selected algorithms and formulae as follows.

$$F_{CH_4,PJ,y} = F_{CH_4,flared,y} + F_{CH_4,EL,y}$$

Where:

$F_{CH_4,EL,y}$  Amount of methane which is destroyed through combustion of collected LFG in the flares in year  $y$  (in  $tCH_4/yr$ )

$F_{CH_4,flared,y}$  Amount of methane in the LFG which is destroyed by flaring in year  $y$  (in  $tCH_4/yr$ ).

The EPIC assessment team confirmed that, as correctly outlined in the revised PDD <sup>/2/</sup>, the amount of methane which is destroyed through combustion of collected LFG in the flares in year  $y$  ( $F_{CH_4,EL,y}$ ) is correctly referred as being determined by

following applicable guidance of the “Tool to determine the mass flow of greenhouse gas in a gaseous stream” (version 02.0.0) <sup>/14/</sup>. Under full conformance with this particular methodological tool,  $F_{CH_4,EL,y}$  is correctly determined through equivalent calculation approach as the one applied for the determination of  $F_{CH_4,sent\_flare,y}$  (both parameters are represented as  $F_{i,t}$  in the tool). The following text is appropriately and correctly added in Section B.6.1 of the revised PDD <sup>/2/</sup>:

*“Determination of the amount of amount of methane which is destroyed through combustion of collected LFG in the internal combustion gas engines ( $F_{CH_4,EL,y}$ ):*

*$F_{CH_4,EL,y}$  is directly determined by following applicable guidance of the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 02.0.0) and by taking into account the following requirements defined by ACM0001 (version 13.0.0):*

- *The gaseous stream the methodological tool shall be applied to is the stream of collected LFG which is sent to each internal combustion gas engine j.*
- *$CH_4$  is the greenhouse gas for which the mass flow is determined;*
- *The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 or 17 in the tool); and*
- *The mass flows should be calculated at least on a an hourly basis for each hour h in year y;*
- *The mass flow calculated for hour h is 0 if the equipment/device is not working in hour h ( $Op_{j,h}$  = not working). Accumulated hourly values are summed to a yearly unit basis.*

*Applicable guidance of the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 02.0.0) will be applied to determine  $F_{CH_4,sent\_flare,y}$  and  $F_{CH_4,EL,y}$  by using one of the options A, B, C or D. The selection of the determination option will depend on project conditions and/or monitoring equipment/instruments under operation during monitoring periods within the 2<sup>nd</sup> 7-year crediting period.*

*(...)*

*In the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” the mass flow of greenhouse gas in a gaseous stream (which in the particular case of the project activity are the amount of methane in collected LFG which is sent to the flares ( $F_{CH_4,sent\_flare,y}$ ) and the amount of methane which is destroyed through combustion of collected LFG in the internal combustion gas engines ( $F_{CH_4,EL,y}$ )) is actually represented as  $F_{i,t}$ .”*

The above-quoted text added in the revised PDD <sup>/2/</sup> was confirmed by the EPIC assessment team as being under full compliance with both the methodological tool “Tool to determine the mass flow of greenhouse gas in a gaseous stream” (version 02.0.0) <sup>/14/</sup> and the applied CDM baseline and monitoring methodology ACM0001 (version 13.0.0) <sup>/17/</sup>.

As appropriately indicated in Section B.6.1 of the revised PDD <sup>/2/</sup>, baseline emissions associated with electricity generation ( $BE_{EC,y}$ ) are not considered in the context of determination of baseline emissions since only type of GHG mitigation measure encompassed by the project activity remains being destruction of methane emissions. Thus, no emission reductions due to displacement of a more-GHG-intensive service (i.e. emission reductions due to generation of electricity using collected LFG as fuel) are eligible and/or claimable for the project activity.

*Assessment of determination of project emissions due to the consumption of electricity by the project activity:*

Under conformance with the revised project design configuration, project emissions

due to the consumption of electricity ( $PE_{EC,y}$ ) are correctly determined as follows:

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

Where:

$PE_{EC,grid,y}$  Project emissions from consumption of grid electricity due to the project activity in year  $y$ .

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

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

As confirmed by the EPIC assessment team, by following applicable guidance of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1) <sup>/13/</sup> valid for Scenario C with Case C.III being selected as a generic approach; project emissions due to grid electricity consumption by the project activity ( $PE_{EC,grid,y}$ ) are correctly determined as follows:

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

Where:

$EC_{PJ,grid,y}$  Quantity of grid sourced electricity consumed by the project activity in year  $y$  (in MWh)

$TDL_{grid,y}$  Average technical transmission and/or distribution losses for providing electricity to the grid and/or for grid sourced electricity consumed by the project activity.

$EF_{EL,grid,y}$  CO<sub>2</sub> emission factor for grid-sourced electricity in year  $y$  (in tCO<sub>2</sub>/MWh).  $EF_{EL,grid,y}$  will be determined by following applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" as follows:

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

As outlined in the revised PDD <sup>/2/</sup>, Options A.1, A.2, B.1. and B.2 of the methodological tool will be analysed ex-post for the determination of  $EF_{EL,grid,y}$  (with the most conservative (higher) value being chosen) as follows:

- Option A.1:  $EF_{EL,grid,y}$  is calculated ex-post as the combined margin (CM) emission factor ( $EF_{grid,CM,y}$ ) as per the methodological tool "Tool to calculate the emission factor for an electricity system" (version 04.0).
- Option A.2:  $EF_{EL,grid,y}$  is directly determined as 1.3 tCO<sub>2</sub>/MWh (applicable conservative default value of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" <sup>/13/</sup>).
- Option B.1.:  $EF_{EL,grid,y}$  is calculated ex-post based in

the CO<sub>2</sub> emissions for the fossil fuel diesel consumed by the installed backup captive off-grid electricity generator as well as based on the ratio between the amount of fuel consumed by such generator and amount of generated electricity during the time period  $t$  (with the fuel net calorific value also being considered) as follows:

$$EF_{EL,grid,y} = \frac{FC_{Diesel,t} \times NCV_{Diesel} \times EF_{CO_2,Diesel}}{EG_{Diesel-generator}}$$

Where:

$FC_{Diesel,t}$  Amount of fossil fuel diesel consumed by the installed backup captive off-grid electricity generator during the time period  $t$  (in liters or kg)

$NCV_{Diesel}$  Net calorific value for fossil fuel diesel (in GJ/liters or GJ/kg)

$EF_{CO_2,Diesel}$  CO<sub>2</sub> emission factor of fuel diesel (in tCO<sub>2</sub>/GJ)

$EG_{Diesel-generator,y}$  Amount of electricity generated by the installed backup captive off-grid electricity generator during the time period  $t$  (in MWh)

Option B.2:  $EF_{EL,grid,y}$  is directly determined as 1.3 tCO<sub>2</sub>/MWh (applicable conservative default value of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" <sup>/13/</sup>).

*Project emissions from consumption of electricity generated by the captive off-grid electricity generator fuelled by fossil fuel:*

Project emissions arising from diesel consumption by the installed backup captive off-grid electricity generator (fuelled by diesel) will be monitored *ex-post* by applying approaches/options B.1 or B.2 as presented in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" <sup>/13/</sup>. The revised PDD <sup>/2/</sup> correctly outlines that as per Options B.1 and B.2 of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" <sup>/13/</sup>,  $PE_{EC,captive,y}$  is calculated as follows:

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

Where:

$EC_{PJ,captive,y}$  Amount of electricity sourced by the captive electricity generator (fuelled by diesel) and consumed by the project activity in year  $y$ .  $EC_{PJ,captive,y}$  will be measured and monitored in MWh/year.

$TDL_{captive,y}$  Average technical transmission and distribution losses for electricity sourced by the captive electricity generator in year  $y$ .

EF<sub>EL,captive,y</sub>

CO<sub>2</sub> emission factor for electricity sourced by the captive off-grid electricity generator in year *y* (tCO<sub>2</sub>/MWh). The revised PDD <sup>/2/</sup> defines that, like in the case of EF<sub>EL,grid,y</sub>, EF<sub>EL,captive,y</sub> will be determined by following applicable guidance of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” <sup>/13/</sup> as follows:

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

Also like in the case of the determination of EF<sub>EL,grid,y</sub>, the Options A.1, A.2, B.1 and/or B.2 of the methodological tool will thus be analysed ex-post for the determination of EF<sub>EL,captive,y</sub>.

It is important to note that, as outlined in the revised PDD <sup>/2/</sup>, while the captive off-grid backup electricity generator (fuelled by diesel) is expected to be used only for emergency purposes (whenever supply of grid-sourced electricity to the project activity is temporarily interrupted), there are no estimated amounts of electricity to be generated by this generator nor estimated amount of fossil fuel diesel to be consumed by the generator in the particular context of ex-ante estimates of project emissions. Thus, consumption of electricity sourced by this backup generator is not considered in such particular context. This is deemed reasonable and acceptable.

As also indicated in the revised PDD <sup>/2/</sup>, a revised project monitoring management structure will be in place in order to address the permanent changes in the project design and revision of the monitoring plan. This management structure will include responsibilities functions and procedures for data recording, collection and archiving, including related QA/QC procedures. Monitoring QA/QC procedures will for additional monitoring include procedures used to double check monitoring data, staff training, calibration of electricity meters and flow meters.

As part of its assessment, it is the opinion of the EPIC assessment team that the revised monitoring plan, as summarized in the revised PDD <sup>/2/</sup>, provides sufficient information about relevant aspects and requirements of the monitoring plan. Such descriptions are under full compliance with applicable monitoring requirements of ACM0001 (version 13.0.0) <sup>/7/</sup> and the applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup>.

It is also the opinion of the EPIC assessment team that, if correctly implemented, the monitoring plan will enable effective verification of emission reductions to be achieved by the project activity.

In summary, the selection of additional ex-ante determined parameters, additional parameters monitored *ex-post* and related monitoring procedures and GHG calculation procedures as per the revised monitoring plan are deemed complete, transparent and in accordance with requirements of the applied CDM baseline and monitoring methodology ACM0001 (version 13.0.0) <sup>/7/</sup> and applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup>.

Assessment of the impact of the above-listed permanent changes in the monitoring plan in terms of applicability of the applied CDM baseline and monitoring methodology and applied methodological tools are included in Section D.7.3.3 below.

## Findings

Two Corrective Action Requests (CARs) were raised by the EPIC validation team

	<p>regarding the changes in the monitoring plan from the registered PDD for the project activity:</p> <p><b>CAR 1:</b> Specification details for the backup captive off-grid electricity generator (installed as a permanent post-registration change in the project design) are missing in the context of the selection of the value for the ex-ante determined parameter “Rated capacity of the installed captive backup electricity generator fuelled by diesel” (PP<sub>,Diesel-generator</sub>).<sup>8</sup></p> <p><b>CAR 3:</b> While both grid-sourced electricity and electricity generated by a backup captive off-grid electricity generator (fuelled by diesel) are used for meeting the project’s electricity demand, the selected Scenarios of the methodological tool “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (version 1) are not valid for both of these electricity sources.</p>
<b>Conclusion</b>	<p>As a conclusion of its assessment, upon successfully closure of the raised CARs, the EPIC validation team confirmed that the description of the revision of the monitoring plan from the registered PDD is correctly and sufficiently described in the version of the PDD <sup>/2/</sup>.</p> <p>In summary, it is the opinion of the EPIC assessment team that the description and design of the revised monitoring plan as per the revised PDD <sup>/2/</sup> complies with all the monitoring requirements of the methodology ACM0001 (version 13.0.0) <sup>/7/</sup> and applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup>.</p> <p>Such description is also under conformance with currently applicable guidelines for completing the CDM-PDD form (version 10.1) <sup>/20/</sup>. It is also opinion of the EPIC assessment team that the project participant is potentially able to implement and operate the revised monitoring plan.</p> <p>Finally, EPIC was able to confirm that, as correctly outlined in the revised PDD <sup>/2/</sup>, the performed changes to the monitoring plan of the project activity indeed require prior approval by the Board as per the applicable CDM rules and procedures.</p>

## D.7. Changes to the project design

<b>Means of validation</b>	<p>In accordance with CDM-VVS-PA (version 019.0) <sup>/7/</sup>, the EPIC assessment team assessed and evaluated the permanent post-registration changes in the design of the project design (as outlined in the revised PDD <sup>/2/</sup> addressing PRCs) in order to <i>inter alia</i> determine whether addressing of such changes in the revised PDD <sup>/2/</sup> is under full compliance with applicable CDM rules and requirements for addressing PRCs under this particular category as per the CDM project standard for project activities (CDM-PS-PA) <sup>/18/</sup>.</p> <p><b>D.7.1 - General description of the occurred permanent changes to the design of the project activity:</b></p>
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<sup>8</sup> Note: As also confirmed by the EPIC assessment team, the parameter “Rated capacity of the installed captive backup electricity generator fuelled by diesel” (PP<sub>,Diesel-generator</sub>) is correctly not any longer included as an ex-ante selected parameter in the version of the PDD addressing CAR 3 <sup>/2/</sup>. Option B.4 is correctly not anymore applied/considered for the determination of project emissions due to consumption of electricity sourced by the installed backup captive generator. This is under conformance with applicable guidance for Case C.III of the methodological tool “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (version 1).

The revised PDD <sup>/2/</sup> addresses permanent changes in its design. As confirmed by the EPIC assessment team, the occurred and yet to occur changes in the project design are correctly summarized in Appendix 7 of the revised PDD <sup>/2/</sup> as follows:

*“Permanent changes in the design of the project activity:*

- *Inclusion of destruction of methane through combustion of LFG in a set of internal combustion gas engines (with gradual/phased implementation schedule) that represents additional/alternative methane destruction devices for the project activity with operations since July/2016. Despite these gas engines represents major components for an electricity generation infrastructure located within the geographical limits of the UVS – Caeiras landfill, the project activity under its revised design configuration does not include electricity generation as an additional GHG abatement measure for which emission reductions would be claimed. Thus, CO<sub>2</sub> emission associated to generation of electricity (using LFG as renewable energy source) are not to be accounted/claimed as part of the project activity.*
- *Meeting of project's electricity demand through electricity generated by a backup captive off-grid electricity generator (fuelled by diesel) (with nameplate installed capacity of 700 kVA (560 kW for a power factor of 0.8)) is added as an option since July/2016.”*

*D.7.1.1 - Inclusion of destruction of methane through combustion of LFG in a set of internal combustion gas engines (with gradual/phased implementation schedule) that represents additional/alternative methane destruction devices for the project activity with operations since July/2016.*

As confirmed by the EPIC assessment team during on-site visit to the project site and assessment of related documents (e.g. publicly available the initial versions of the Monitoring Reports for the monitoring periods from 01/07/2016 to 31/12/2016 and from 01/01/2017 to 30/06/2017 <sup>/72/ /73/</sup>), since July/2016, methane has been destroyed through combustion of collected LFG mostly in a set of internal combustion gas engines that, as outlined in the revised PDD <sup>/2/</sup>, are claimed to represent additional/alternative methane destruction devices for the project activity.

As also confirmed by the EPIC assessment team and as correctly outlined in the revised PDD <sup>/2/</sup>, each one of the internal combustion gas engines is part of an individual state-of-the-art engine-generators set type 4, model/series G-420 manufactured in Austria by GE Jenbacher GmbH & Co OHG and with individual nameplate power generation capacity of 1.4 MW each.

The electricity generation infrastructure (for which the set of internal combustion gas engines represents the major components) has been implemented under phased/gradual implementation phases. As confirmed by the EPIC assessment team and correctly outlined in the revised PDD <sup>/2/</sup>, the following implementation schedule is valid for the implementation of such electricity generation infrastructure:

electricity generation infrastructure, Implementation phase	Year of starting of operations	Number of internal combustion gas engines to be installed during the implementation phase and total combined installed capacity for the total power generation infrastructure encompassed by the phase
Phase 1	2016 (since July/ 2016)	21 internal combustion gas engines
Phase 2	2019	Additional 4 internal combustion gas engines
Phase 3	2020	Additional 2 internal combustion gas engines

As part of the operation of the project activity under its revised design configuration, very largest share of generated electricity has been and will be exported through the electricity grid the project activity is connected to.

As per information correctly made available in the revised PDD <sup>/2/</sup>, the electricity



generation infrastructure located within the geographical limits of the UVS – Caieiras landfill (for which the set of internal combustion gas engines represent major components) is entirely fuelled by collected LFG and encompasses the gradual/phased installation and operation of up to 27 container-based modular engine-generator sets (with each set comprising a GE Jenbacher, type 4 model/series G-420 (or similar) engine-generator set (with individual nameplate power generation capacity of 1.4 MW) + all required ancillary equipment)) under 3 implementation phases. The main specifications of the backup captive off-grid electricity generator that was made under operational status in July/2016 are also confirmed by the EPIC assessment team as being appropriately added in Sections A.3 and B.6.2 of the revised PDD <sup>/2/</sup>.

The EPIC assessment team also verified that, as indicated in the revised PDD <sup>/2/</sup>, the electricity generation infrastructure (for which the installed set of internal combustion gas engines represents major components) also includes the installation and continuous operation of LFG treatment and cooling infrastructure in which all LFG directed to the set of gas engines has been filtered/cleaned and cooled (removal of SO<sub>x</sub>, siloxanes, furans and other contaminants + cooled) in an activated carbon filtering system and in an electrical gas chiller.

As assessed below, the project activity (under its revised design configuration) does not encompass/include electricity generation as an additional GHG abatement measure. No emission reductions associated to displacement of a more-GHG-intensive service (i.e. CO<sub>2</sub> emission reductions due to generation of electricity using collected LFG as renewable energy source) are to be accounted and/or claimed by project activity along the remaining share of its 2<sup>nd</sup> 7-year crediting period. As also outlined in the revised PDD <sup>/2/</sup>, the project activity, under its revised design configuration, remains encompassing methane destruction as its unique GHG abatement measure.

Assessment for the non-inclusion of electricity generation as additional GHG abatement measure as part of the project activity + non-accounting of emission reductions associated to displacement of a more-GHG-intensive service (i.e. CO<sub>2</sub> emission reductions due to generation of electricity using collected LFG as renewable energy source):

As outlined in the revised PDD <sup>/2/</sup>, the project activity (under its revised design configuration) does not encompass/include electricity generation as an additional GHG abatement measure. Due to that, no emission reductions associated to displacement of a more-GHG-intensive service (i.e. CO<sub>2</sub> emission reductions due to generation of electricity using collected LFG as renewable energy source) is to be accounted and/or claimed by project activity along the remaining share of its 2<sup>nd</sup> 7-year crediting period. As also outlined in the revised PDD <sup>/2/</sup>, the project activity, under its revised design configuration, remains encompassing methane destruction as its unique GHG abatement measure. Section A.3 of the revised PDD <sup>/2/</sup> includes a text box that includes details for aspects, rationale e reasons for such non-inclusion of additional GHG abatement measure as part of the project activity.

As verified by the EPIC assessment team, the rationale for the acceptance of the project activity under its revised design configuration being regarded as a methane destruction initiative only (with emission reductions associated to displacement of a more-GHG-intensive service (i.e. CO<sub>2</sub> emission reductions due to generation of electricity using collected LFG as renewable energy source) not being considered/accounted) is sustained based on the following aspects:

- There is a time-horizon of about 9.5 years from the previously occurred commission and starting of operations of the project activity (under its initial design configuration) (February/2007) to the more

	<p>recently occurred starting of operations of power generation using LFG as fuel within the geographical limits of the UVS – Caieiras landfill (July/2016). The time-horizon is confirmed by the EPIC assessment team as being even larger when the yet to occur implementation phases 2 and 3 of the power generation infrastructure (within years 2019 and 2020) and the previously occurred initial design conceptualization and CDM consideration for the project activity (within years 2004/2005) are considered. Such time horizons reasonably justifies that the so far occurred and yet to occur capital expenditures and decision-making processes for the implementation of such power generation source using LFG are not related or linked to the previously occurred CDM consideration for the project activity<sup>9</sup>. In summary, as appropriately outlined in the revised PDD <sup>12/</sup>, “(...) in the particular case of the project activity, generation of electricity using LFG as gaseous fuel represents an initiative that for which related infrastructure implementation + related decision-making process did not previously occur at the time of the occurred project’s initial design conceptualization and CDM consideration (within years 2004 and 2005).”</p> <p>- Non-accounting of CO<sub>2</sub> emission reductions due to extension/addition of GHG abatement measure promoting generation of electricity in the grid-connected electricity generation infrastructure (for which the set of internal combustion gas engines represents the major components), as confirmed by the EPIC assessment team, is also in line and under conformance with item (d) of the Ruling note “Rationale for rejection of PRC-0171-004” (CDM-PA0171-RULE01) <sup>69/</sup>. As verified by the EPIC assessment team, the Ruling note CDM-PA0171-RULE01 indeed establishes the following in its item (d):</p> <p style="padding-left: 40px;"><i>“The PP/DOE may wish to submit a post registration change to reflect the actual implementation of the project activity and continue claiming CERs from the landfill gas (LFG) capture and destruction (...)”</i></p> <p>As per provisions of para. 151 of CDM-PCP-PA (version 1.0), a phone call was conducted on 27/03/2018 among members of the UNFCCC’s CDM Secretariat, the members of the EPIC assessment and review and representative of the project participant Essencis Soluções Ambientais S.A. in which clarifications on the ruling CDM-PA0171-RULE01 were provide <sup>74/</sup>. Among the provide clarifications, the members of the CDM Secretariat clarified and confirmed to all other call participants that the project participants and EPIC were in position to submit a revised PDD and a Validation Opinion Report requesting approval of post-registration changes claiming methane</p>
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<sup>9</sup> As confirmed by the EPIC assessment team, the revised PDD <sup>12/</sup> appropriately includes the disclaimer below in Section A.3 regarding the definition of CDM consideration:

*“The following definition of “CDM consideration as per applicable CDM rules (i.e. CDM Project Standard for Project Activities) is relevant:*

*The time of “occurred CDM consideration” refers to the time within the investment decision-making process for implementing the project when “CDM benefits were considered necessary in the decision to undertake the project” (i.e. “(...) benefits of the CDM were a decisive factor in the decision to proceed with the project).”*

The content of the above-quoted disclaimer was confirmed by the EPIC assessment team as being correct.

	<p>destruction through combustion of collected LFG in both the set of flares and set of internal combustion gas engines as part of the project activity.</p> <p>Destruction of methane through combustion of LFG in both the set of the high temperature enclosed flares and the set of internal combustion gas engines (with gradual/phased implementation schedule) (with both sets being regarded as methane destruction devices for the project activity) is thus appropriately regarded as being the only measure encompassed by the project activity (under its revised design configuration).</p> <p>It is also the opinion of the EPIC assessment team that it is deemed reasonable and acceptable, as outlined in the revised PDD <sup>12/</sup>, considering the gradual/phased inclusion of the set of internal combustion gas engines (that represents additional/alternative methane destruction devices for the project activity) as a permanent change in the project design not representing and not encompassing any extension/addition of GHG measures and/or technologies<sup>10</sup>.</p> <p>In summary, by taking into account the above-summarized aspects (especially the content of the Ruling note "Rationale for rejection of PRC-0171-004" (CDM-PA0171-RULE01) <sup>169/</sup>), it is the opinion of the EPIC assessment team that the decision of the project participant Essencis Soluções Ambientais S.A. of having the project activity not accounting and not claiming of related CO<sub>2</sub> emissions associated with generation of electricity by the power generation infrastructure located within the limits of the UVS – Caieiras landfill (for which the set of internal combustion gas engines represents major components) and thus remain considering methane destruction (due to combustion of collected LFG in the project's methane destruction devices) as the unique GHG abatement measure for the project activity are deemed reasonable and acceptable.</p>
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<sup>10</sup> As confirmed by the EPIC assessment team, the revised PDD <sup>12/</sup> appropriately and opportunely includes the disclaimer below in Section A.3 regarding the CDM definitions for GHG abatement measure, technology and output (good/services):

*"The CDM definition of measure and technology are summarized below:*

Measure (for emission reduction activities): Measure is a broad class of greenhouse gas (GHG) emission reduction activities that possess common features. A project activity can include single or multiple measures. The reason to divide the project activity into multiple measures is that the baseline for the output generated by measure may change depending upon the measures. Four types of measures are currently covered in the guidelines:

- (i) Fuel and/or feedstock switch (example: switch from naphtha to natural gas, or switch from limestone to gypsum in cement clinker production);
- (ii) Switch of technology with or without change of energy source (example: energy efficiency improvements, power generation based on renewable energy);
- (iii) GHG destruction (example: landfill gas flaring, incineration of HFC23 gas vented from HCFC22 production unit);
- (iv) GHG formation avoidance (example: use of biomass that would have been left to decay in a solid waste disposal site resulting in the formation and emission of methane, for energy generation).

Technology: equipment or conversion process used for the production of goods or provision of services. Two different project activities/CPAs are considered to be using the same technology(ies) if they:

- (i) Provide the same kind of output and use the same kind of equipment and conversion process; or
- (ii) Undertake the same course of action that results in the same kind of effect (e.g. two projects using the same management practice such as fuel switching);

*In the context of definition of technology, the following definition of output is relevant (with destruction of methane per se not being assumed as representing a good or a service).*

Output: goods or services with comparable quality, properties, and application areas (e.g. clinker, lighting, residential cooking, waste disposal, steam produced, electricity produced)."

The content of the above-quoted disclaimer was confirmed by the EPIC assessment team as being correct.

Such decisions are sufficiently in line with applicable CDM rules and principles in the opinion of the EPIC assessment team<sup>11</sup>.

As verified by the EPIC assessment team, the text box made available in Section A.3 of the revised PDD <sup>/2/</sup> also includes reasonable aspects and clarifications that sustain that no quantitative increase in terms of methane destruction is to be promoted with combustion of LFG also occurring in the set of internal combustion gas engines (additional/alternative methane destruction devices for the project activity). By reviewing project's monitoring data for the period from July/2016 onwards (as indicated in publicly available the initial versions of the Monitoring Reports for the monitoring periods from 01/07/2016 to 31/12/2016 and from 01/01/2017 to 30/06/2017 <sup>/72/ /73/</sup>), the EPIC assessment team was able to confirm that during such assessed 1-year length period from 01/07/2016 to 30/06/2017, the largest share of LFG collected by the project activity (under its revised design configuration) indeed has being mostly combusted in the set of internal combustion gas engines, with the amount of LFG being sent to the flares being reduced proportionally.

As a result of performed review of specifications of both the set of installed high temperature enclosed flares and set of installed internal combustion gas engines <sup>/6/</sup>, the EPIC assessment team also confirms that the assertion added in the revised version of the PDD <sup>/2/</sup> claiming that the estimated total and final combined LFG consumption for the set of internal combustion gas engines (under the last implementation phases of the grid-connected electricity generation infrastructure) represents about 50% less than the total combined LFG flaring capacity of the previously installed project's flares is deemed correct.

It is also opinion of the EPIC assessment team that it is deemed reasonable to assume that, as also claimed in the revised PDD <sup>/2/</sup>, in the absence of the more recently installed set of internal combustion gas engines, all collected LFG would remain being sent to combustion in currently installed 4 high temperature enclosed flares as part of the operation of the project activity.

**D.7.1.2 - Meeting of project's electricity demand through electricity generated by a backup captive off-grid electricity generator (fuelled by diesel):**

As an additional permanent change in project design, a backup captive off-grid electricity generator (fuelled by diesel) with nameplate installed capacity of 0.560 MW is also installed as part of the project activity since July/2016. As confirmed by the EPIC assessment team, such backup captive off-grid electricity generator has been used under emergency/backup situations. The backup electricity generator

<sup>11</sup> As confirmed by the EPIC assessment team, the revised PDD <sup>/2/</sup> appropriately and opportunely includes the disclaimer below in Section A.3 regarding recent decisions from the CDM-EB regarding rules for CDM definitions for GHG abatement measure, technology and output (good/services):

*"While in May/2018 there was still no definitive CDM rules and procedures for addressing post-registration changes encompassing addition of new technologies/measures contributing to emissions reductions, it is relevant to note that the CDM-EB considered a concept note on changes in CDM project activity, PoAs or CPAs to be allowed as post-registration changes on its ninety-ninth meeting (EB99) with new rules being agreed. While such agreed rules applicable for permanent changes in project design encompassing increase of capacity and extension of measure/technology are yet to be included in the regulatory documents CDM Project Standard for Project Activities (CDM-PS-PA), CDM Validation and Verification Standard for Project Activities (CDM-VVS-PA) and CDM Project Cycle Procedure for Project Activities (PCP-PA), the CDM-EB has agreed in its EB99 meeting that, "in deciding the effective date of these new rules, sufficient time should be given to stakeholders to minimize adverse impacts on existing or planned post-registration changes."*

The content of the above-quoted disclaimer was confirmed by the EPIC assessment team as being correct.

has been used to meet the electricity demand of the project activity during temporary planned or unplanned circumstances supply of grid-sourced electricity to the project activity is temporarily interrupted.

As confirmed by the EPIC assessment team, the following table included in the revised PDD <sup>/2/</sup> correctly summarizes the specification of the installed backup captive off-grid electricity generator is as follows:

Specifications for the backup captive off-grid electricity generator (fuelled by diesel)	
Manufacturer	STEMAC Grupos Geradores (Brazil)
Model/product	G – GMC
Power	700 kVA (560 kW for a power factor of 0.8) (440 V voltage, 60 Hz frequency)
Main components	Diesel engine: Scania DC1649A Generator: WEG GTA 312AI45 B35T Command display: model DS7320

In summary, it is the opinion of the EPIC assessment team that the overall description of the permanent changes of the project design is deemed correct and sufficiently made available in the revised version the PDD <sup>/2/</sup>. Furthermore, is in the opinion of the EPIC assessment team that the non-inclusion of electricity generation as additional GHG abatement measure as part of the project activity + non-accounting of emission reductions associated to displacement of a more-GHG-intensive service (i.e. CO<sub>2</sub> emission reductions due to generation of electricity using collected LFG as renewable energy source) is deemed reasonable, acceptable and sufficiently justified in the revised PDD <sup>/2/</sup>.

#### **D.7.2 – Further assessment general details of the changes to the project design:**

##### **D.7.2.1 - Assessment of environmental aspects related to the permanent changes in the project design:**

As verified by the EPIC assessment team and correctly reported in the revised PDD <sup>/2/</sup>, the so far occurred construction and starting of operations (under its initial implementation phase) of the electricity generation infrastructure (for which the installed set of internal combustion gas engines represents major components) are under conformance with requirements established in the environmental/construction licensing process of no. 29/00794/09 within the competent environmental authority “Companhia de Tecnologia de Saneamento Ambiental” (CETESB).

Through review of documentation for the related environmental/construction licensing process, possible environmental impacts related to the implementation and construction of the project's new electricity generation infrastructure (under its initial implementation phase) were appropriately addressed and approved.

On the basis of its sectoral expertise, the EPIC assessment team acknowledges that, as also reported in the revised PDD <sup>/2/</sup>, the permanent changes in the project design do not promote major negative environmental aspects.

As also appropriately reported in the revised PDD <sup>/2/</sup>, measures were taken during the construction phase of the electricity generation infrastructure in order to mitigate any possible negative or undesired environmental aspect for related construction efforts (incl. appropriate solid waste and effluent handling, etc.) (as indeed required by currently approved environmental licencing process for implementing and operating such infrastructure).

Moreover, monitoring of emission of local pollutants during testing and commissioning phases of the electricity generation infrastructure (e.g. monitoring of emissions of nitrogen oxides (NO<sub>x</sub>) through the exhaust system of the container-based modular engine-generator sets) is also indicated in the revised PDD <sup>/2/</sup> as being also performed as part of the currently concluded environmental licensing

process as required by CETESB.

As also confirmed by the EPIC assessment team, in March/2016, the project's new electricity generation infrastructure was granted with an operational environmental permit (no. 29000393) <sup>/34/</sup> that allowed its starting of operations. This permit was issued prior to the occurred starting of operation of the electricity generation infrastructure.

*D.7.2.2 - Timeline for the occurred and yet to occur (planned) implementation and starting of operations of the project's new electricity generation infrastructure:*

Through assessment of operation records for the project activity, the EPIC assessment team was able to confirm the correctness of the following milestone for the so far occurred implementation and starting of operations of the set of 21 internal combustion gas engines (as reported in the revised PDD <sup>/2/</sup>):

*"Milestone for the starting of operations of the grid-connected electricity generation infrastructure located within the geographical limits of the UVS – Caieiras landfill (under phase 1):*

- *01/07/2016: Connection of the set of internal combustion gas engines to the project's main LFG supply pipeline, thus technically allowing collected LFG to be combusted in such alternative methane destruction devices.*
- *08/07/2016: Starting of operations of the whole electricity generation infrastructure as part of the conclusion of testing and commissioning work for such infrastructure.*
- *11/07/2016: Upon conclusion of all related testing and commissioning activities for the electricity generation infrastructure and upon conclusion of all required configuration of the project's monitoring data gathering, processing and recording system; continuous operation of the project activity under its revised design configuration (i.e. including the set of internal combustion gas engines as additional/alternative methane destruction devices and with all required monitoring data being measured, processed and recorded) has started."*

Also based on assessment of operational records for the project activity, the EPIC assessment team was able to confirm that the backup captive off-grid electricity generator (fuelled by diesel) with nameplate installed capacity of 0.560 MW was installed and made under operational conditions in July/2016.

*D.7.2.3 - Reasons and rationale for the occurred and yet to occur (planned) implementation of the project's new electricity generation infrastructure:*

As verified by the EPIC assessment team, the declared reason for the changes in the project design was finally promoting a more economically rational and environmentally friendlier use of LFG collected by as part of the operation of the project activity. The grid-connect electricity generation infrastructure located within the geographical limits of the UVS – Caieiras landfill (for which the set of internal combustion gas engines represents major components) promotes utilization of collected LFG for electricity generation.

As also confirmed by the EPIC assessment team, the backup captive off-grid electricity generator fuelled by diesel was installed in order to meet the project's electricity demand whenever supply of grid-sourced electricity is interrupted.

*D.7.2.4 Assessment whether the permanent changes in the project design will impact the overall operation of the project activity and its ability to achieve GHG emission reductions as stated in the PDD:*

As further assessed in Section D.7.1.1, it is the opinion of the EPIC assessment team that, in general terms, in a technological and operational perspective, the post-registration permanent changes in the project design will not negatively impact the overall operation/ability of the project activity to deliver emission reductions as

stated in the currently registered version of the PDD valid for the 2<sup>nd</sup> 7-year crediting period (version 6.0, dated 17/05/2016) <sup>/3/</sup>.

While the project activity (under its revised design configuration) remains encompassing methane destruction as its unique GHG abatement measure, the overall magnitude of emission reductions to be achieved by the project are not expected to change as a result of implementation of the changes.

The addition of a backup captive off-grid generator does not promote any significant/relevant negative impact over the overall operation/ability of the project activity to deliver GHG emission reductions. As per the revised project design configuration, such backup unit is expected to be used only during not frequent emergency circumstances when connection to the electricity grid is interrupted. Under such circumstances, associated GHG emissions due to the operation of the backup unit fuelled by fossil-fuel are completely accounted as project emissions (as required by ACM0001 (version 13.0.0) <sup>/17/</sup> and applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup>).

Furthermore, by taking into account the nature of occurred permanent changes from the registered monitoring plan of the project activity, it is also confirmed that such changes in monitoring plan do not negatively impact the overall operation of the project activity, its ability to achieve GHG emission reductions and/or accuracy of the overall monitoring process either.

It is also crucial to note that the permanent changes in the project design and the changes in the monitoring plan do not affect the applicability of ACM0001 (version 13.0.0) and applicable methodological tools applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup> either.

As confirmed by the EPIC assessment team, none of the applicability and monitoring requirements for the applied CDM baseline and monitoring methodology and methodological tools are adversely affected by the changes. Explanations of how the project activity (under its revised design configuration) meets all applicability conditions of the applied CDM baseline and monitoring methodology and methodological tools are sufficiently added in Section B.2 of the revised PDD <sup>/2/</sup>. It is also relevant to note that definitions of project boundary, emission sources and GHGs for the project activity (under its revised design configuration) are also correctly and sufficiently added in Section B.3 of the revised PDD <sup>/2/</sup>.

#### **D.7.3 - Assessment whether the changes impact the project activity in terms of additionality, scale, applicability of the applied CDM baseline and monitoring methodology and compliance of the monitoring plan with applied CDM methodology:**

The table below summarizes if/how the post-registration changes raise potential adverse impacts (concerns) over specific CDM requirements:

*Assessment of potential adverse impacts of the permanent post-registration changes in the project design with specific CDM requirements*

CDM requirement of which related potential impact caused by the changes in the project design should be assessed	Do the changes raise potential adverse impacts with the CDM requirement? <sup>12</sup>	
	Yes	No
Additionality of the project activity (see assessment details in Section D.7.3.1)	<input checked="" type="checkbox"/>	<input type="checkbox"/>

<sup>12</sup> In the context of the performed EPIC assessment, the term “*raising potential adverse impacts*” means assessment whether the changes have an impact on the CDM requirement in question. It does not necessarily mean that the CDM requirement is not any longer met and/or the previous demonstration of the underlying CDM requirement is jeopardized.

Scale of CDM project activity (see assessment details in Section D.7.3.2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Applicability and application of approved CDM baseline methodology (+ applicable methodological tools) (see assessment details in Section D.7.3.3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Compliance of the monitoring plan with the applied monitoring methodology(ies) (+ applicable methodological tools) (or level of accuracy of the monitoring compared with the requirements contained in the registered monitoring plan) (see assessment details in Section D.7.3.4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

D.7.3.1 – Assessment of the impact of the changes in the context of the additionality of the project activity

Assessment of the application of Step 2 (Barrier Analysis) of the methodological tool the methodological tool “Combined tool to identify the baseline scenario and demonstrate additionality” in the revised PDD:

Step 2 (Barrier Analysis) of the methodological tool the methodological tool “Combined tool to identify the baseline scenario and demonstrate additionality” is applied in the revised PDD <sup>/2/</sup> for identifying the baseline scenario of the project activity (under its revised design configuration) as well as to demonstrate that the previously assessed additionality of the project activity is not undermined by the changes in the project design. As opportunely outlined in Section B.5 of the revised PDD <sup>/2/</sup>, when the CDM validation project activity was concluded (in year 2005), the project's additionality was demonstrated and assessed by appointing barriers for the implementation of the project activity. As confirmed by the EPIC assessment team, the revised PDD <sup>/2/</sup> correctly includes quotations from such appointed barriers (as per the previous versions of the PDD valid for the expired 1<sup>st</sup> 7-year crediting period of the project activity (PDD version 3, dated 05/12/2005 <sup>/4/</sup> and PDD version 4, dated 10/01/2013):

*“(...) The main barrier is economic. There are no revenues associated with the surplus of around 30% of LFG collection and flaring. Technically, the landfill operator would have to increase the wells density, flaring capacity, energy consumption, among others. This will require significant investments (around 100 US\$ / Nm<sup>3</sup>/h of capacity installed for such size of landfill) and will draw up the landfill costs, mainly linked to energy consumption and LFG capture network operation and maintenance (around 10 US\$ /1,000Nm<sup>3</sup> collected for such size of landfill). At the time of the project design initial conceptualization, potential competitors of the Caieiras landfill were: Bandeirantes, Lara (Maua), Pajoan (Itaquaquecetuba), CTR Pedreira (SP), CTR Paulinia (Paulinia), Anaconda (Sta Izabel), Coveg (Santana do Parnaíba). At the time of the project design initial conceptualization, none of these landfills had LFG collection and flaring system. The ones that had a collection system in place at that time were promoted by financial subsidies, like CDM project (...). Hence, the costs increasing would difficult Caierias competitiveness. (...)”*

*“(...) The main barrier is market options. At the time of the project design initial conceptualization, electricity generation using LFG as fuel were not competitive with the usual sources. Electricity normal price for the producer (59.65 R\$/MWh), was lower than the power generation costs (per MWh) using LFG as fuel. To turn such project feasible, the Brazilian Government has created the “Alternative Sources for Electricity Generation” (PROINFA) Incentive Program. But for the first phase of the program, Caieiras landfill does not fulfil*



*the requirements to participate. And at the time of the project design initial conceptualization, there was no perspective for a second program for the next years. (...)*

*"At the time of the project design initial conceptualization, it was considered that the success of the CDM project would be an important element to help mitigating the technical barrier (...)"*

*"No revenues are associated with landfill gas capture and burning. As a consequence, selling CERs will provide the necessary revenue to turn the activity feasible."*

As also confirmed by the EPIC assessment team, the CDM validation report for the project activity (dated 12/12/2005) issued by the DOE Det Norske Veritas A/S (DNV) (Report No: 2005-0458, rev. 04) states the following regarding the assessment of the additionality for the project activity:

*"(...) Step 2 - Investment analysis Not applicable (Only Step 3 is selected)*

*Step 3 - Barrier analysis: It was demonstrated that the project is not a likely baseline scenario due to the additional costs necessary for increasing the LFG capture capacity without having any revenues.*

*(...)"*

As appropriately justified in the revised PDD <sup>/2/</sup>, no significant advancements in LFG destruction/utilization technology and collection efficiency for LFG have occurred in most emerging developing countries within the latest years. The content of the report Global Waste Management Outlook – 2015, issued by the International Solid Waste Association (ISWA) and United National Environment Programme (UNEP) in year 2015 <sup>/75/</sup> is appropriately claimed in the revised PDD <sup>/2/</sup> as representing credible documented evidence for such assertion. The revised PDD <sup>/2/</sup> also sustains that such existent lack of advancements is also applicable for the particular case of the project host-country Brazil. In fact, as confirmed by the EPIC assessment team, there is still no activities similar to the proposed project activity under operation or implementation without consideration of CDM benefits as claimed in the revised PDD <sup>/2/</sup>. As outlined in Section B.5 of the revised PDD <sup>/2/</sup> and confirmed by the EPIC assessment team, all initiatives encompassing LFG collection and destruction so far existent in Brazil are implemented (or are being implemented) as project-based initiatives under the CDM. The same applies for initiatives promoting utilization of LFG for electricity generation or for other purpose.

By taking into account (i) the nature of the post-registration changes (with the only GHG mitigation measure encompassed by the project activity remain being destruction of methane emissions); (ii) the baseline scenario for the project activity (encompassing methane emissions only) and (iii) the previously identified barriers; it is EPIC opinion that previously identified barriers for implementing the project activity (as a methane destruction measure) are appropriately regarded as still being valid and applicable in the absence of CDM as claimed in the revised PDD <sup>/2/</sup>.

In summary, it is reasonable to assume that the previously identified barriers are still valid/applicable for the project activity (under its revised design configuration) in the absence of the CDM.

Assessment of the application of Step 4 (Common practice analysis) of the methodological tool the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" in the revised PDD:

In order to demonstrate the extent to which the project activity (under its revised design configuration) would be diffused in the relevant sector; a common practice analysis is performed (as per applicable guidance of the methodological tool “Common Practice” (version 03.1) <sup>/24/</sup>) as an additional credibility check in order to demonstrate that the previously assessed and demonstrated additionality of the project activity is indeed not undermined by the changes in its design configuration.

As verified by the EPIC assessment team, the implementation of the project activity (under its revised design) is demonstrated not being common practice. Detailed EPIC assessment for the performed common practice analysis is included in Appendix 5 of this Validation Opinion Report.

In summary, based on its assessment of application of Step 2 and Step 4 of the methodological tool “Combined tool to identify the baseline scenario and demonstrate additionality” in the revised PDD <sup>/2/</sup>, it is the EPIC opinion that the revised PDD <sup>/2/</sup> sufficiently and correctly addresses the required demonstration of non-undermining of the previously assessed additionality of the project activity. In this context, EPIC also confirmed that all related texts added in Section B.5 of the revised PDD <sup>/2/</sup> are deemed reasonable and correct. In summary, previously identified and assessed barriers are still valid/applicable for the project activity (under its revised design configuration) in the absence of the CDM.

In summary, it is the opinion of the EPIC assessment team that, when considering the project under its revised design configuration, the most attractive baseline scenario remains being the previously identified BAU scenario for emissions of methane.

While the BAU scenario for emissions of methane (alternative LFG2) remains being identified as the baseline scenario for the project activity, , the baseline scenario is thus sufficiently demonstrated as NOT being “*the project activity (under its revised design configuration) being undertaken without being registered as a CDM project*”. This is under conformance with provisions of the methodological tool “Combined tool to identify the baseline scenario and demonstrate additionality” (version 06.0) <sup>/22/</sup>

Furthermore, it is also confirmed by the EPIC assessment team that it is sufficiently demonstrated that implementation of the previously identified baseline alternative LFG1 (without being registered as CDM project) remains being prevented by barriers. Alternative LFG1 represents “*the project activity (under its revised design configuration) being undertaken not as a CDM project activity*”.

In summary, in the particular context of assessment of potential adverse impact of the post-registration changes of the design of the project activity over its previously demonstrated additionality, it is thus sufficiently and well demonstrated that the additionality is not undermined by the changes. Moreover, it is confirmed that applicable guidelines and requirements for demonstrating the non-undermining of the previously assessed additionality of the project activity by the changes in its design are sufficiently met.

#### D.7.3.2 - Assessment of the impact of the changes in terms of scale of the project activity

By taking into account that the nature of the changes in the project design, the EPIC assessment team confirms that such changes do not adversely affect the scale of the project activity. The project activity remains being a large-scale CDM project activity.

D.7.3.3 - Assessment of the impact of the changes in terms of applicability of the applied CDM baseline and monitoring and/or applied methodological tools

*Permanent changes in the project design:*

By taking into account that the nature of the post-registration changes in the project design, the EPIC assessment team confirms that, as indicated in the revised PDD <sup>/2/</sup>, such changes do not promote any impact in terms of eligibility and application of the CDM baseline and monitoring methodology ACM0001 (version 13.0.0) <sup>/7/</sup> and applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup>. ACM0001 (version 13.0.0) <sup>/7/</sup> remains being applicable for combustion of collected LFG in the methane destruction devices encompassed by the project activity under its revised design configuration.

*Revision of the monitoring plan:*

The revision of the monitoring plan does not compromise monitoring requirements and applicability criteria for ACM0001 (version 13.0.0) <sup>/7/</sup> either. The revised PDD <sup>/2/</sup> includes additional calculation and monitoring provisions by correctly applying applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1) <sup>/13/</sup>, the "Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion" (version 2) <sup>/15/</sup> and the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0). It is relevant to note that although the revised PDD <sup>/2/</sup> remains applying ACM0001 (version 13.0.0) <sup>/7/</sup>, the revised PDD applies more recent (latest) versions of the following methodological tools:

- "Combined tool to identify the baseline scenario and demonstrate additionality (version 06.0) <sup>/22/</sup>
- "Common practice" (version 03.1) <sup>/24/</sup>

Description about meeting of applicability conditions of the above-listed methodological tools and ACM0001 (version 13.0.0) are sufficiently and correct included in Section B.2 of the revised PDD <sup>/2/</sup>. In summary, the EPIC assessment team confirmed that the whole content of the revised PDD <sup>/2/</sup> complies with all applicability requirements and criteria for applied CDM baseline and monitoring methodology (ACM0001 (version 13.0.0) + all applied methodological tools.

D.7.3.4 - Assessment of the impact of the changes in terms of compliance of the monitoring plan with applied monitoring methodology (+ applicable methodological tools) and/or level of accuracy of the monitoring when compared with requirements as per the registered monitoring plan

As further assessed in Section D.7.3, the permanent changes in the project design and the revision of the monitoring plan do not promote any negative impact over the level of accuracy and completeness in the context of monitoring requirements for the project activity (under its revised design configuration) as no previously existent monitoring requirement is excluded or modified as a result of such changes. Furthermore, these post-registration changes do not adversely affects compliance of the monitoring plan with the applied monitoring methodologies ACM0001 (version 13.0.0) <sup>/7/</sup> and applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup> either.

Thus, the overall level of accuracy of the monitoring when compared with the requirements contained in the applied monitoring methodology ACM0001 (version 13.0.0) <sup>/7/</sup> + applied methodological tools <sup>/13/ /15/ /17/ /12/ /14/ /21/ /22/ /24/ /31/</sup> is not negatively affected by the changes under any circumstance. As required by the CDM project standard for project activities (CDM-PS-PA) <sup>/18/</sup>, all these aspects are also indicated in the revised PDD <sup>/2/</sup>.

**Findings**

One Correction Action Request (CAR) and one Clarification Request (CL) were raised regarding the occurred and yet to occur (planned) permanent changes to the project design of the project activity:

	<p><b>CL 1:</b> Further details and/or documented evidences about the occurred construction, commissioning date and starting of operations of the electricity generation infrastructure (including milestone dates for the relevant facts/aspects as well as details about the occurred unforeseen delay in the conclusion of the construction of the infrastructure) are to be provided.</p> <p><b>CAR 2:</b> As outlined in the Ruling note “Rationale for rejection of PRC-0171-004” (CDM-PA0171-RULE01) (that was previously issued by the CDM Executive Board (CDM-EB) on 01/03/2018 as an outcome of the rejection by this board of a previously submitted request of approval of post-registration changes for the project activity in September/2017 - under PRC ref. PRC-0171-004), the project design description (under its revised design configuration) and its demonstration of eligibility are presented in the revised PDD not under conformance with applicable CDM rules.</p>
<b>Conclusion</b>	<p>It is the opinion of the EPIC assessment team that, upon successful closure of the raised CAR and CL, details of the permanent changes in the project design are correctly and sufficiently described in the revised version of PDD <sup>/2/</sup>. Moreover, it is the opinion of the EPIC assessment team that details about the timeline/forecasts for the implementation of the post-registration changes in the project design are also correctly and sufficiently described in the revised version of PDD <sup>/2/</sup>.</p> <p>It is sufficiently demonstrated that the decision and measures related to the installation of a backup captive off-grid electricity generator (fuelled by diesel) and the inclusion of the set of internal combustion gas engines as additional/alternative methane destruction devices for the project activity are all dated after the occurred registration of the project as a CDM project activity.</p> <p>Furthermore, by taking into account the related aspects and justifications as added in the revised version of the PDD <sup>/2/</sup> (especially the content of the Ruling note “Rationale for rejection of PRC-0171-004” (CDM-PA0171-RULE01) <sup>/69/</sup>), it is the opinion of the EPIC assessment team that the decision of the project participant Essencis Soluções Ambientais S.A. of not accounting and not claiming CO<sub>2</sub> emissions associated with generation of electricity by the electricity generation infrastructure located within the limits of the UVS – Caieiras landfill (for which the set of internal combustion gas engines represents major components) and thus remain considering methane destruction (due to combustion of collected LFG in the project's methane destruction devices) as the unique GHG abatement measure for the project activity are deemed reasonable and acceptable.</p> <p>Despite the project activity (under its revised design configuration) does not encompass addition of GHG abatement measure, the revised PDD <sup>/2/</sup> refers in its Section B.6.1 to the fact that in May/2018 there was still no definitive CDM rules and procedures for addressing post-registration changes encompassing addition of new technologies/measures contributing to emissions reductions. As appropriately added in the revised PDD <sup>/2/</sup> and confirmed by the EPIC assessment team, the CDM-EB considered a concept note on changes in CDM project activity <sup>/71/</sup>, PoAs or CPAs to be allowed as post-registration changes on its ninety-ninth meeting (EB99) <sup>/70/</sup>. As part of such meeting new rules were discussed and agreed for addressing permanent changes in project design including increase of capacities and/or addition/extension of GHG abatement/mitigation measure(s) or technology(ies) in previously registered CDM project activities. As also confirmed by the EPIC assessment team, while such agreed rules are yet to be included in the regulatory documents CDM Project Standard for Project Activities (CDM-PS-PA), CDM Validation and Verification Standard for Project Activities (CDM-VVS-PA) and CDM Project Cycle Procedure for Project Activities (PCP-PA), the CDM-EB has included the following in its EB99 meeting report <sup>/70/</sup>:</p> <p><i>“(…) in deciding the effective date of these new rules, sufficient time should be given to stakeholders to minimize adverse impacts on existing or planned post-</i></p>

	<p><i>registration changes.”</i></p> <p>By taking into account the nature of the changes in the project design of the project activity, the content of the Ruling Note CDM-PA0171-RULE1<sup>769/</sup> and related content of the EB99 meeting report<sup>770/</sup>; it is the opinion of the EPIC assessment team that not taking into account or applying the recently agreed new rules applicable for permanent changes in project design including increase of capacities and/or addition/extension of GHG abatement/mitigation measure(s) or technology(ies) in the revised PDD<sup>72/</sup> is deemed reasonable and acceptable.</p> <p>Finally, EPIC was able to confirm that the changes to the project design indeed require prior approval by the Board as per the applicable CDM rules and procedures.</p>
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#### D.8. Changes specific to afforestation and reforestation project activities

<b>Means of validation</b>	Not applicable. The project activity is not if afforestation and/or reforestation category.
<b>Findings</b>	Not applicable. The project activity is not if afforestation and/or reforestation category.
<b>Conclusion</b>	Not applicable. The project activity is not if afforestation and/or reforestation category.

#### SECTION E. Internal quality control

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The Validation Opinion Report underwent a Technical Review (TR) process prior of being approved and submitted to UNFCCC in the context of the request for approval of post-registration changes of the registered CDM project activity. The TR is an independent assessment process that is performed by an internal technical review team (a qualified technical reviewer, with assistance from specialists where necessary) and aims to examine thoroughly that the process of validation assessment for PRCs has been fully performed under conformance with applicable CDM rules and requirements for assessment of PRCs (as established by the latest version of the CDM-VVS-PA (version 01.0)<sup>71/</sup>) as well as under conformance with EPIC internal working procedures.

The Team Leader (Lead auditor) provides a copy of the draft version of the Validation Opinion Report to the appointed Technical Review Team Leader (including any necessary supporting documentation). The Technical Review Team reviews the documentation. It is the role of the Technical Review Team to ensure that all related assessment activities have been performed by the assessment team by exercising utmost diligence and complete adherence to the applicable CDM rules and requirements for assessment of PRCs (including compilation of the Validation Opinion Report). The review encompasses all aspects related to the assessment of the post-registration changes as well as the closure of eventually raised CARs and CLs during the assessment process.

As part of its performed tasks, the technical review team may raise Clarification Requests to the assessment team and/or discuss raised issues with the Team Leader. After the agreement of the responses to the Clarification Requests received from the assessment team (as well as from the project participant(s) if applicable), the final version of the Validation Opinion Report is thus accepted for further processing (such as approval and uploading phases via the UNFCCC interface).

#### SECTION F. Validation opinion

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EPIC Sustainability Services Pvt. Ltd. (EPIC) was commissioned by the project participant Essencis Soluções Ambientais S.A. to perform a validation opinion assessment for a set of post-registration changes (PRCs) for the registered CDM project activity “Caieiras landfill gas emission reduction” (UNFCCC Project no. 0171). The performed assessment is independent from any

previously initiative or yet to be initiated periodic verification assessment and it was performed under the “Prior approval” process track for addressing PRCs. The performed assessment is applicable for the following types of eligible post-registration changes:

- Permanent changes in the design of the project activity:
  - Inclusion of destruction of methane through combustion of LFG in a set of internal combustion gas engines (with gradual/phased implementation schedule) that represents additional/alternative methane destruction devices for the project activity with operations since July/2016. Despite these gas engines represents major components for an electricity generation infrastructure located within the geographical limits of the UVS – Caieiras landfill, the project activity under its revised design configuration does not include electricity generation as an additional GHG abatement measure for which emission reductions would be claimed. Thus, CO<sub>2</sub> emission associated to generation of electricity (using LFG as renewable energy source) are not to be accounted/claimed as part of the project activity.
  - Meeting of project’s electricity demand through electricity generated by a backup captive off-grid electricity generator (fuelled by diesel) (with nameplate installed capacity of 700 kVA (560 kW for a power factor of 0.8)) is added as an option since July/2016.
- Permanent changes from the registered monitoring plan:
  - Revision of the applied monitoring and GHG calculation approaches by including additional monitoring requirements and calculation approaches for determining the following emissions as a result of the changes in the project design:
    - (i) Baseline emissions for methane (due to destruction of LFG (rich in methane) also occurring in the set of internal combustion gas engines (regarded as additional/alternative methane destruction devices).
    - (ii) Project emissions (due to the consumption of electricity sourced by the installed backup captive off-grid electricity generator (fuelled by diesel)).  
Project emissions due to consumption of electricity (sourced by the grid or backup generator (fuelled by diesel)) by the project activity will determined by applying guidance of Scenario C of the methodological tool “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (version 01) to these sources of electricity consumption.

As a result of the related revision of the applied GHG calculation and monitoring approaches, additional ex-ante determined parameters and parameters monitored ex-post are added (i.e.  $Op_{j,h}$ ,  $EF_{EL,captive,y}$ ,  $EF_{EL,grid,y}$ ,  $EC_{PJ,captive,y}$ ,  $FC_{Diesel,y}$ ,  $NCV_{Diesel,y}$ ,  $EF_{CO2,Diesel,y}$ ,  $EG_{Diesel-Generator,y}$  and  $TDL_{captive,y}$ ) and the parameter  $TDL_{grid,y}$  will be monitored ex-post (as established by the methodological tool “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”).

- Corrections (that do not affect the project design):
  - General text and terminology revision of project description in order to fully comply with the currently applicable requirements for completing the CDM-PDD form (version 10.1) (as established by its attachment “Instructions for completing this form”) and to enhance/improve the project design description.
  - Minor text improvements (incl. review of statements and correction of previously existent typographic mistakes) in order to improve the overall project description.

- Revision of ex-ante estimates of emission reductions to be achieved by the project activity during its 2<sup>nd</sup> 7-year crediting period (by inter alia taking into account the determination of project emissions due to consumption of electricity by the project activity through application of Scenario C of the methodological tool “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (version 01)).
- The name of the landfill hosting the project activity is changed from “CTR Caieiras landfill” to “UVS - Caieiras landfill” reflecting the occurred change in early 2017 of the designation of the landfill hosting the project activity that was made by the project participant and project owner Essencis Soluções Ambientais S.A. as part of the operationalization of the company’s commercial, marketing and sustainability strategy.
- Updated contact information details for the project participant Essencis Soluções Ambientais S.A. is added (in line with the latest version of the completed Modalities of Communication (MoC) form for the project activity).
- Details about performed task-force involving capital and labor intensive maintenance, repair and parts replacement work in existing project’s LFG collection infrastructure and operational improvements for such infrastructure held during the period from July/2016 to July/2017 are added in Section A.3.

Addressing by the project participant Essencis Soluções Ambientais S.A. of all the above-summarized PRCs was sufficiently and correctly performed through the compilation of a revised PDD (version 9.0, dated 20/07/2018) that was validated by the appointed EPIC assessment team.

The revised PDD (version 9.0, dated 20/07/2018) was made available and was assessed by the EPIC assessment team. As part of its performed assessment, besides assessing all changes as per the revised PDD, the EPIC assessment team also performed review of an also revised version of the emission reduction calculation spreadsheet (with calculations of *ex-ante* estimations of emission reductions to be achieved by the project activity during the 2<sup>nd</sup> 7-year renewable crediting period)) This spreadsheet format document is enclosed to the revised PDD.

As verified by the EPIC assessment team, the revised PDD (version 9.0, dated 20/07/2018) is completed by correctly applying the CDM baseline and monitoring methodology ACM0001 (version 13.0.0) – “Flaring and utilization of landfill gas” + the following methodological tools:

- Emissions from solid waste disposal sites (version 07.0)
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption (version 1)
- Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion (version 02)
- Project emissions from flaring (version 2.0.0)
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 02.0.0)
- Tool to calculate the emission factor for an electricity system (version 04.0)
- Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period (version 03.0.1)
- Combined tool to identify the baseline scenario and demonstrate additionality (version 06.0)

The EPIC assessment team was also able to confirm that the revised PDD was completed by correctly applying the latest version of the CDM-PDD form (version 10.1) with applicable guidance for completing the CDM-PDD form being appropriately followed.



As an outcome of its performed assessment, it is the EPIC opinion that the revised PDD sufficiently addresses and incorporates the above summarized eligible post-registration changes. Furthermore, all explanations and justifications provided to EPIC by the representatives of the project participant Essencis Soluções Ambientais S.A. regarding information and assumptions, as presented in the revised PDD, are deemed reasonable, trustful, and acceptable.

It is also the opinion of the EPIC assessment team that the revised PDD sufficiently and correct takes into account all remarks and considerations from Ruling note “Rationale for rejection of PRC-0171-004” (CDM-PA0171-RULE01) that was previously issued by the CDM Executive Board (CDM-EB) on 01/03/2018 as an outcome of the rejection by this board of a previously submitted request of approval of post-registration changes for the project activity in September/2017 (under PRC ref. PRC-0171-004). Furthermore, the EPIC validation team also took into consideration the recent decisions of the CDM-EB its on its 99<sup>th</sup> meeting that are applicable to post-registration changes of encompassing increase of capacity and addition of technology/measures in previously registered CDM project activities and programme of activities<sup>13</sup>.

In summary, the permanent changes in the project design, the permanent revision monitoring plan and applied corrections (in information that do not affect the project design), as addressed in the revised PDD, correctly reflect the application of the applicable CDM guidance and procedures regarding these particular categories of post-registration changes as per the latest version of the CDM project standard for project activities (CDM-PS-PA).

EPIC thus recommends approval of the revised PDD (version 9.0, dated 20/07/2018) for the project activity under the “*Prior approval*” process track for addressing post-registration permanent changes of a registered CDM project activity.

Note: EPIC highlights that as part of its assessment and validation opinion for the post-registration changes for the CDM project activity “Caieiras landfill gas emission reduction” as per the revised PDD (version 9.0, dated 20/07/2018), no re-assessments of CDM requirements and criteria other than the ones applicable/required for assessing such post-registration changes, were performed by the EPIC assessment team (e.g. assessments previously performed as part of the CDM validation of the project activity and/or CDM renewal of crediting period for the project activity). The limited scope of the validation opinion assessment performed by EPIC for the encompassed post-registration changes is under full compliance with applicable assessment requirements and rules as per the latest version of the CDM validation and verification standard for project activities (CDM-VVS-PA).

Prepared by	Approved by :
 (Marco A. Ratton) Assessment Team Leader	 (Krishnachar Sudheendra) Director & Head-Operations

<sup>13</sup> The CDM-EB decided on its 99<sup>th</sup> meeting that the yet to occur preparation and inclusion of the regulatory texts reflecting the agreed new rules for post-registration changes including increase of capacity and/or addition of new technology/measures in the CDM regulatory documents (i.e. CDM-PS <sup>/18/</sup>, CDM-VVS <sup>/17/</sup> and CDM-PCP <sup>/19/</sup>) will represent sufficient time being given to project participants and other stakeholders of CDM project activities with these types of post-registration changes, thus minimizing adverse impacts on existing or planned post-registration changes.



## Appendix 1. Abbreviations

Appendix 2.	Abbreviations	Full texts
	ACM	Approved Consolidated Methodology (CDM baseline and monitoring methodology)
	ANP	Brazilian National Agency of Petroleum, Natural Gas and Biofuels ( <i>Agência Nacional do Petróleo, Gás Natural e Biocombustíveis</i> )
	CAR	Corrective Action Request
	CDM	Clean Development Mechanism
	CDM-EB	Clean Development Mechanism Executive Board
	CDM-M&P	Modalities and Procedures for Clean Development Mechanism
	CDM-PCP-PA	CDM project cycle procedures for project activities
	CDM-PS-PA	CDM project standard for project activities
	CDM-VVS-PA	CDM validation and verification standard for project activities
	CER	Certified Emission Reduction
	CH <sub>4</sub>	Methane
	CL	Clarification Request
	CMP	Meeting of Parties to the Kyoto Protocol
	CO <sub>2</sub>	Carbon dioxide
	CO <sub>2</sub> e	Carbon dioxide equivalent
	COP/MOP	The Conference of the Parties to the United Nations Framework Convention on Climate Change serving as the Meeting of the Parties to the Kyoto Protocol
	DNA	Designated National Authority
	DOE	Designated Operational Entity
	ER	Emission Reduction
	FAR	Forward Action Request
	GHG	Greenhouse Gas
	ISWA	International Solid Waste Association
	HDPE	High Density Polyethylene
	LFG	Landfill gas
	LPG	Liquefied petroleum gas
	IPCC	Intergovernmental Panel on Climate Change
	MP	Monitoring Plan
	MR	Monitoring Report
	MSW	Municipals solid waste
	PDD	Project Design Document
	PLC	Programmable logic controller
	PNRS	Política Nacional de Resíduos Sólidos (Brazilian National Policy on Waste Management as established by Federal Law No. 12,305/10 (the LPNRS).
	PP	Project Participant
	QA/QC	Quality Assurance / Quality Control
	UNEP	United Nations Environment Programme
	UNFCCC	United Nations Framework Convention for Climate Change

## Appendix 2. Competence of team members and technical reviewers

All personnel being engaged in CDM verification/validation/certification assessments performed by EPIC are qualified based on the established procedures of EPIC to assure the resource requirements that sufficiently satisfy all the requirements of competence criteria for Designated Operational Entities (DOEs) as established the CDM Accreditation Standard (CDM-AS). EPIC is accredited as a DOE and holds the full responsibility on decision-making and opinion in the context of performed validation/verification/certification CDM assessments in accordance with the accreditation requirements as defined by the CDM-EB.

The following assessment team has been assigned to carry out the validation opinion assessment for post-registration changes applicable for the CDM project activity “Caieiras landfill gas emission reduction” (UNFCCC reference number 0171):

Name	Mr Marco A. Ratton	Dr G. Vishnu	Mr. R. Vijayaraghavan
Role	Lead Auditor	Auditor	Technical Reviewer
Competence in relevant sectoral scope(s):	Sectors 1 and 13	N/A	Sectors 1 and 13
Responsibility	Performance of document review, performance of on-site visit, preparation of initial list of findings, assessment of responses from the project participants for all list of findings and assessment of updated/corrected documents, preparation of the and draft Validation Opinion Report (addressing comments from the performed technical review) and preparation of final Validation Opinion Report.	Review of documents, assistance in the preparation of the Validation Opinion Report	Performance of Technical review

**Mr. Marco A. Ratton** is based in Brazil and has acted as a CDM auditor since 2007. He holds vast experience with independent assessments of CDM project activities within the area of solid waste management and effluent treatment implemented in Latin America and other regions. He also has previous working experience with planning of municipal waste management as well as educational background in mechanical fabrication & manufacturing technologies, economics and environmental management & policy. He has undergone extensive training on CDM validation and verification and is a qualified Lead Auditor for Sectoral Scope 13 under Technical Area “Waste handling and disposal” and Sector Scope 1 in accordance with procedures of EPIC sustainability services Pvt. Ltd. He also has previous experience on conducting ISO 9001/14001 assessments.

**Dr. G. Vishnu** holds a Masters and Doctorate in Environmental Science. He has around 8 years of experience in the field of research and consultancy related to water, wastewater, solid waste management systems, implementation of new, Cleaner Production technologies and biomass assessment studies. He has more than four years’ experience in validation verification of more than thirty CDM projects and has undergone extensive training on GHG validation and verification.

He is a Lead Auditor for various technical areas. He is also an ISO 26000 lead auditor and ISO 50001 auditor certified by Professional Evaluation and Certification Board (PECB). He is a Certified Sustainability Assurance Practitioner (CSAP) from AccountAbility, UK. He is qualified as Lead Auditor based on EPICs CDM accreditation procedures.

**Mr. R. Vijayaraghavan** holds BE in Mechanical Engineering, M.Tech in Energy Conservation and Management and MBA in Technology Management. He is certified as Energy Auditor by Bureau of Energy Efficiency (BEE), Government of India. He has 10 years of working experience in energy sector including validation / verification of fifty CDM and VCS/GS projects and has undergone extensive training on CDM validation and verification and has been qualified as Lead Auditor with Sectoral Scope 1 and 13. He is also an ISO 26000 lead auditor certified by Professional Evaluation and Certification Board (PECB).

### Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
/1/	UNFCCC/CDM-EB	CDM validation and verification standard for project activities (CDM-VVS-PA), version 01.0 as per EB 93	Dated 03/03/2017. Available online: <a href="https://cdm.unfccc.int/filestorage/e/x/t/extfil_e-20170502114945594-reg_stan06.pdf/reg_stan06.pdf?t=cWp8b3R2M2t0fDAXWDyXxZale42piqGzzqTF">https://cdm.unfccc.int/filestorage/e/x/t/extfil_e-20170502114945594-reg_stan06.pdf/reg_stan06.pdf?t=cWp8b3R2M2t0fDAXWDyXxZale42piqGzzqTF</a>	Others
/2/	Essencis Soluções Ambientais S.A.	Revised version of the Project Design Document (PDD) for the 2 <sup>nd</sup> 7-year renewable crediting period for the CDM project activity: “Caieiras landfill gas emission reduction”, version 9.0 (under both clean and tracked changes version )	Dated 20/07/2018	Project Participants <sup>14</sup>
/3/	Essencis Soluções Ambientais S.A.	PDD for the 2 <sup>nd</sup> 7-year renewable crediting period for the CDM project activity: “Caieiras landfill gas emission reduction”, version 6.0 (currently registered version).	Dated 17/05/2016. Available online: <a href="https://cdm.unfccc.int/filestorage/F/B/6/FB6OH42GVKL08TRMJICYAZPX9QN5S7/PDD%20Caieiras%20V%206.0_clean.pdf?t=WVJ8b3F0d3E2fDATgJAdjC3RCRh97EBWA1oh">https://cdm.unfccc.int/filestorage/F/B/6/FB6OH42GVKL08TRMJICYAZPX9QN5S7/PDD%20Caieiras%20V%206.0_clean.pdf?t=WVJ8b3F0d3E2fDATgJAdjC3RCRh97EBWA1oh</a>	Project Participants
/4/	Essencis Soluções Ambientais S.A.	Project Design Document (PDD) for the 1 <sup>st</sup> 7-year renewable crediting period for the CDM project activity: “Caieiras landfill gas emission reduction”, versions 3.0 and 4.0	Dated 10/01/2013 (version 4) and 12/09/2005 (version 3) Available online: <a href="https://cdm.unfccc.int/filestorage/c/p/H5JLUGUVIE1NX8Y6Z92TM4RBKQ0PSF.pdf/PDD%20Caieiras%20Version%204%20-%2010012013%20%28clean%29.pdf?t=Z">https://cdm.unfccc.int/filestorage/c/p/H5JLUGUVIE1NX8Y6Z92TM4RBKQ0PSF.pdf/PDD%20Caieiras%20Version%204%20-%2010012013%20%28clean%29.pdf?t=Z</a>	Project Participants

<sup>14</sup> All document with provider indicated as “Project Participants” were sourced by the host-country project participant and project owner Essencis Soluções Ambientais S.A.

			<a href="#">kF8b3F4b3difDDZR RRnaR_TGi7tTSFa3 DtW</a>  <a href="https://cdm.unfccc.int/filestorage/8/6/E/86E0SPMCDLQ6VJI512NE6PJVKFIFTG/001-JS-Caieiras%20PDD%20sep%202005%20English%20vs03%2012-09-05.pdf?t=a0R8b3R5dTBtfDDampHqV-wtsRPe94YQcF-c">https://cdm.unfccc.int/filestorage/8/6/E/86E0SPMCDLQ6VJI512NE6PJVKFIFTG/001-JS-Caieiras%20PDD%20sep%202005%20English%20vs03%2012-09-05.pdf?t=a0R8b3R5dTBtfDDampHqV-wtsRPe94YQcF-c</a>	
/5/	Essencis Soluções Ambientais S.A.	<p>Emission reduction calculation spreadsheet with <i>ex-ante</i> estimations of emission reductions to be achieved by the CDM project activity “Caieiras landfill gas emission reduction” during the 2<sup>nd</sup> 7-year renewable crediting period. Version 9.0.</p> <p>File name: “CER CAI – V 9.0”</p>	Dated 20/07/2018	Project Participants
/6/	GE Jenbacher GmbH & Co OHG	Specification Sheet for the engine-generator set GE Jenbacher Type 4, G-420 series	<p>Dated: 28/08/2013</p> <p>Available online:  <a href="http://north-tec-shop.de/media/pdf/jms_420_gs_bl_b28.pdf">http://north-tec-shop.de/media/pdf/jms_420_gs_bl_b28.pdf</a> </p>	Others
/7/	UNFCCC/CDM-EB	Consolidated baseline and monitoring methodology ACM0001 - “Flaring or use of landfill gas”, version 13.0.0	<p>Dated 11/05/2012.</p> <p>Available online:  <a href="https://cdm.unfccc.int/filestorage/E/Y/F/EYFHCV3K4J5P06DTQSG9WLMOBNUX2I/EB67_repan12_ACM0001_ver13.0.0.pdf?t=Rzh8b3F4cDNpfDA==c4nIDSzlwWhR4sXpUE4">https://cdm.unfccc.int/filestorage/E/Y/F/EYFHCV3K4J5P06DTQSG9WLMOBNUX2I/EB67_repan12_ACM0001_ver13.0.0.pdf?t=Rzh8b3F4cDNpfDA==c4nIDSzlwWhR4sXpUE4</a> </p>	Others
/8/	UNFCCC	Kyoto Protocol to the United Nations Framework Convention on Climate Change	<p>Dated 1998.</p> <p>Available online:  <a href="http://unfccc.int/resource/docs/convkp/kpeng.pdf">http://unfccc.int/resource/docs/convkp/kpeng.pdf</a> </p>	Others
/9/	UNFCCC	Decision 3/CMP. 1 (Marrakesh – Accords)	<p>Dated 30/03/2006.</p> <p>Available online:  <a href="https://cdm.unfccc.int/Reference/COPMOP/08a01.pdf">https://cdm.unfccc.int/Reference/COPMOP/08a01.pdf</a> </p>	Others
/10/	TÜV SÜD South	CDM Validation Report for the	Dated 24/09/2013.	Others

	Asia Pvt. Ltd.	renewal of the 7-year crediting period for the CDM project activity "Caieiras landfill gas emission reduction". Report No. 600501161	Available online: <a href="https://cdm.unfccc.int/filestorage/n/4/OTA_EFNR0V549XYI6CQ_S2BHZGU13KWL.pdf/Validation%20report_171_25%20sept.pdf?t=RWP8b3F4cDYxfDDAUuG9v2YmekyY6bhJU2si">https://cdm.unfccc.int/filestorage/n/4/OTA_EFNR0V549XYI6CQ_S2BHZGU13KWL.pdf/Validation%20report_171_25%20sept.pdf?t=RWP8b3F4cDYxfDDAUuG9v2YmekyY6bhJU2si</a>	
/11/	IPCC	1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book; 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book.	Available online: <a href="http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol5.html">http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol5.html</a>	Others
/12/	UNFCCC/CDM-EB	Methodological tool "Project emissions from flaring", version 2.0.0.	Dated 20/07/2012. Available online: <a href="https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v2.0.pdf/history_view">https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v2.0.pdf/history_view</a>	Others
/13/	UNFCCC/CDM-EB	Methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", version 1.	Dated 16/05/2008. Available online: <a href="https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf/history_view">https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf/history_view</a>	Others
/14/	UNFCCC/CDM-EB	Methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", version 02.0.0.	Dated 03/06/2011. Available online: <a href="https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v2.0.0.pdf/history_view">https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v2.0.0.pdf/history_view</a>	Others
/15/	UNFCCC/CDM-EB	Methodological tool "Tool to calculate project or leakage CO <sub>2</sub> emissions from fossil fuel combustion", version 02.	Dated 02/08/2008. Available online: <a href="https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf/history_view">https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf/history_view</a>	Others
/16/	UNFCCC/CDM-EB	Methodological tool "Tool to calculate the emission factor for an electricity system", version 3.0.0.	Dated 23/11/2012. Available online: <a href="https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.1.pdf/history_view">https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.1.pdf/history_view</a>	Others
/17/	UNFCCC/CDM-EB	Methodological tool "Tool to calculate the emission factor for an electricity system",	Dated 04/10/2013. Available online: <a href="https://cdm.unfccc.int">https://cdm.unfccc.int</a>	Others

		version 04.0.	<a href="#">/methodologies/PAmethodologies/tools/am-tool-07-v1.1.pdf/history_view</a>	
/18/	UNFCCC/CDM-EB	CDM project standard for project activities (CDM-PS-PA), version 01.0.	Dated 03/03/2017. Available online: <a href="https://cdm.unfccc.int/filestorage/e/x/t/extfile-20170307130848253-reg_stan04.pdf/reg_stan04.pdf?t=cTd8b3R1eHZyfDBwN-0WNAgJmcTcqySq_hMC">https://cdm.unfccc.int/filestorage/e/x/t/extfile-20170307130848253-reg_stan04.pdf/reg_stan04.pdf?t=cTd8b3R1eHZyfDBwN-0WNAgJmcTcqySq_hMC</a>	Others
/19/	UNFCCC/CDM-EB	CDM project cycle procedure for project activities (CDM-PCP-PA), version 01.0.	Dated 03/03/2017. Available online: <a href="https://cdm.unfccc.int/filestorage/e/x/t/extfile-20170307130803944-pc_proc03.pdf/pc_proc03.pdf?t=Nkt8b3R2NjJpfDAIURUdn1PFvUP-PjXhorfF">https://cdm.unfccc.int/filestorage/e/x/t/extfile-20170307130803944-pc_proc03.pdf/pc_proc03.pdf?t=Nkt8b3R2NjJpfDAIURUdn1PFvUP-PjXhorfF</a>	Others
/20/	UNFCCC	Project design document form for CDM project activities (incl. the attachment "Instructions for completing this form", version 10.1.	Dated 28/06/2017. Available online: <a href="https://cdm.unfccc.int/filestorage/e/x/t/extfile-20170628103247392-PDD-Form05.pdf/PDD-Form05.pdf?t=Qkx8b3VnZ2s4fDBUNSFjIS9PCk5hIB2a43O3">https://cdm.unfccc.int/filestorage/e/x/t/extfile-20170628103247392-PDD-Form05.pdf/PDD-Form05.pdf?t=Qkx8b3VnZ2s4fDBUNSFjIS9PCk5hIB2a43O3</a>	Others
/21/	UNFCCC/CDM-EB	Methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period", version 03.0.1.	Dated 02/03/2012. Available online: <a href="http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf">http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf</a>	Others
/22/	UNFCCC/CDM-EB	Methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality", version 06.0.	Dated 24/07/2015. Available online: <a href="https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v4.0.0.pdf/history_view">https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v4.0.0.pdf/history_view</a>	Others
/23/	Essencis Soluções Ambientais S.A.	Completed Modalities of Communication (MoC) form for the CDM project activity	Available online: <a href="https://cdm.unfccc.int/Projects/DB/DNV-">https://cdm.unfccc.int/Projects/DB/DNV-</a>	Project Participants

		"Caieiras landfill gas emission reduction"(incl. Annex 1 and Annex 2)	<a href="http://cdm.unfccc.int/view?cp=1">CUK1134509951.62/view?cp=1</a>	
/24/	UNFCCC/CDM-EB	Methodological tool "Common practice", version 03.1.	Dated 03/06/2015 Available online: <a href="https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-24-v1.pdf">https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-24-v1.pdf</a>	Others
/25/	Essencis Soluções Ambientais S.A.	Monitoring Report for the CDM project activity "Caieiras landfill gas emission reduction". 13 <sup>th</sup> periodic verification (monitoring period from 01/01/2016 to 30/06/2016). Version 2.0	Dated: 27/10/2016 Available online: <a href="https://cdm.unfccc.int/filestorage/9/E/5/9E52I8LNDBYGFXPSTVQ6UWCJAROH4Z/MR%2013%20-%20Caieiras%20-%20V.2?t=R3h8b3F5MjlyfDCYfFiffiFZVW81rakLBoOU">https://cdm.unfccc.int/filestorage/9/E/5/9E52I8LNDBYGFXPSTVQ6UWCJAROH4Z/MR%2013%20-%20Caieiras%20-%20V.2?t=R3h8b3F5MjlyfDCYfFiffiFZVW81rakLBoOU</a>	Project Participants
/26/	EPIC	CDM Verification and Certification Report for the CDM project activity "Caieiras landfill gas emission reduction". 13 <sup>th</sup> periodic verification (monitoring period from 01/01/2016 to 30/06/2016). Version 1.0	Dated 03/11/2016 Available online: <a href="https://cdm.unfccc.int/filestorage/S/V/X/SVXDW1ET47I96O8FCBZJ3P0UKL2H/V_R_0171_13th.pdf?t=Zk98b3F5MmRsfDCFXyYLS8f93fSs9tLBTAs">https://cdm.unfccc.int/filestorage/S/V/X/SVXDW1ET47I96O8FCBZJ3P0UKL2H/V_R_0171_13th.pdf?t=Zk98b3F5MmRsfDCFXyYLS8f93fSs9tLBTAs</a>	Others
/27/	Brazil's Interministerial Commission on Global Climate Change (DNA of Brazil)	CO <sub>2</sub> emission factors for electricity generation in Brazil National Interconnected System – Base year 2016.	Available online: <a href="http://www.mctic.gov.br/mctic/opencms/textogeral/emissao_despacho.html">http://www.mctic.gov.br/mctic/opencms/textogeral/emissao_despacho.html</a>	Others
/28/	Mayer-Brown / Taul & Chequer	Legal update / interpretation: Regulation of Brazil's National Policy on Waste Management	Available online: <a href="http://www.tauilchequer.com.br/publications/article.asp?id=10261&amp;nid=13012">http://www.tauilchequer.com.br/publications/article.asp?id=10261&amp;nid=13012</a>	Others
/29/	Essencis Soluções Ambientais S.A.	Selection of company internal reported financial records; year 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015 and 2016.	Dated from year 2008 to year 2016	Project Participants
/30/	Essencis Soluções Ambientais S.A.	Schematic technical drawing with the lay-out of the new electricity generation facility located at the UVS - Caieiras landfill	Dated year 2015	Others
/31/	UNFCCC/CDM-EB	Methodological tool "Investment analysis", version 7.0 as per EB 92	Dated 04/11/2016. <a href="https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v7.0.pdf">https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v7.0.pdf</a>	Others



/32/	Det Norske Veritas AS	"Validation Report Caieiras landfill gas emission reduction in Brazil", Report No. 2005-0458, Revision No. 04.	Dated 12/12/2005. Available online: <a href="https://cdm.unfccc.int/filestorage/N/M/7/NM771JHTEVQX03MBC7943RSL8UWMR9/Caieiras%20Validation%20Report_v04_2005-12-12.pdf?t=R3V8b3F5OGxpfDBno506F5H9HI2YRxbdBSe">https://cdm.unfccc.int/filestorage/N/M/7/NM771JHTEVQX03MBC7943RSL8UWMR9/Caieiras%20Validation%20Report_v04_2005-12-12.pdf?t=R3V8b3F5OGxpfDBno506F5H9HI2YRxbdBSe</a>	Others
/33/	EBC – Agencia Brasil	Information about the implementation of the project's new electricity generation infrastructure made publicly available in regional and national media in Brazil (article titled " <i>Maior termelétrica com combustível renovável é inaugurada em São Paulo</i> ")	Dated 16/09/2016. Available online: <a href="http://agenciabrasil.ebc.com.br/economia/noticia/2016-09/major-termelétrica-com-combustivel-renovavel-e-inaugurada-em-sao-paulo">http://agenciabrasil.ebc.com.br/economia/noticia/2016-09/major-termelétrica-com-combustivel-renovavel-e-inaugurada-em-sao-paulo</a>	Others
/34/	Companhia de Tecnologia de Saneamento Ambiental (CETESB)	Environmental licence for the electricity generation infrastructure within the limits of the UVS - Caieiras landfill (Permit no. 29000393 for the enterprise " <i>TERMOVERDE CAIEIRAS LTDA.</i> ")	Dated year March/2016 Information available online: Available online: The issued operational environmental permit is also available for download at the document searching engine at the website of CETESB ( <a href="http://licenciamento.cetesb.sp.gov.br/cetesb/processo_consulta.asp">http://licenciamento.cetesb.sp.gov.br/cetesb/processo_consulta.asp</a> )	Others
/35/	CONAMA	Federal Resolution CONAMA no. 001/86	Dated 23/01/1986. Available online: <a href="http://www.mma.gov.br/port/conama/res/res86/res0186.html">http://www.mma.gov.br/port/conama/res/res86/res0186.html</a>	Others
/36/	Essencis Soluções Ambientais S.A.	Schematic technical drawing (wiring diagram) with the electrical lay-out of the project's new electricity generation infrastructure	Dated July 2016	Others
/37/	Essencis Soluções Ambientais S.A.	Registered version of the Project Design Document (PDD) for the 1 <sup>st</sup> 7-year renewable crediting period for the CDM project activity:	Dated March/2005 Available online: <a href="https://cdm.unfccc.int/filestorage/F/S/_FS_285759185/PDD_S">https://cdm.unfccc.int/filestorage/F/S/_FS_285759185/PDD_S</a>	Project Participants

		"Caieiras landfill gas emission reduction", version 5	<a href="#">alvador%20da%20Bahia_March%202005.pdf?t=TDN8b2swYT VpfDAkAhBrHVqASk1f6SM9ckX7</a>	
/38/	Brazilian Ministry of Energy / Empresa de Pesquisas Energéticas (EPE)	Official information for performed public auction for power supply held in year 2007 and organized by the Brazilian Ministry of Energy	Dated 26/07/2007 Available online: <a href="http://www.epe.gov.br/imprensa/PressReleases/20070726_1.pdf">http://www.epe.gov.br/imprensa/PressReleases/20070726_1.pdf</a>	Others
/39/	Deloitte Touche Tohmatsu Limited	International tax, Brazil Highlights – 2016	Dated year 2016. Available online: <a href="https://www2.deloitte.com/br/en/pages/doing-business-brazil/articles/corporate-taxation.html">https://www2.deloitte.com/br/en/pages/doing-business-brazil/articles/corporate-taxation.html</a>	Others
/40/	KPMG International	KPMG's Corporate Tax Rates Survey January, 2006	Dated year 2006 Available online: <a href="http://people.stern.nyu.edu/adamodar/pdffiles/articles/KPMGtaxratesurvey.pdf">http://people.stern.nyu.edu/adamodar/pdffiles/articles/KPMGtaxratesurvey.pdf</a>	Others
/41/	KPMG auditores independentes Ltda.	Report, International Tax Brazil – November 2003 – March 2004	Dated year 2004. Available online: <a href="http://www.kpmg.com.br/publicacoes/tax/March2004.pdf">http://www.kpmg.com.br/publicacoes/tax/March2004.pdf</a>	Others
/42/	ICLEI	Guía para el Aprovechamiento de Biogás en Rellenos Sanitarios Municipales (title translated into English language as "Guidelines for utilization of biogas in landfill sites")	Dated April 2013 Available online: <a href="http://biogas-iclei.pacmun.org.mx/wp-content/uploads/2013/04/Gu%C3%ADaAprovechamientoBiog%C3%A1s_VF.pdf">http://biogas-iclei.pacmun.org.mx/wp-content/uploads/2013/04/Gu%C3%ADaAprovechamientoBiog%C3%A1s_VF.pdf</a>	Others
/43/	United States Environmental Protection Agency (US-EPA)	Landfill Methane Outreach Program. Project Development Handbook.	Dated September 2010. Available online: <a href="http://www.epa.gov/lmop/publications-tools/handbook.html">http://www.epa.gov/lmop/publications-tools/handbook.html</a>	Others
/44/	Empresa de Pesquisa Energéticas - EPE	Official information for performed public auction for power supply held in year 2015 and organized by the Brazilian Ministry of Energy (continuous supply starting on 01/01/2017)	Available online: <a href="http://www.epe.gov.br/leiloes/Paginas/Leil%C3%A3o%20de%20Energia%20de%20Fontes%20Alternativas%202015/Leil%C3%A3oFA2015negociaenergiade11usinascomdes%C3%A1giode1.96.aspx?CategoriaID=6976">http://www.epe.gov.br/leiloes/Paginas/Leil%C3%A3o%20de%20Energia%20de%20Fontes%20Alternativas%202015/Leil%C3%A3oFA2015negociaenergiade11usinascomdes%C3%A1giode1.96.aspx?CategoriaID=6976</a>	Others

/45/	ANEEL	Official records from database of registered grid-connected power generation sources under operation in Brazil ( <i>Banco de Informações de Geração - BIG</i> ) valid for the enterprise “ <i>Termoverde Caieiras</i> ” (power generation source with ANEEL registration code <a href="http://UTE.RU.SP.031436-6.01">UTE.RU.SP.031436-6.01</a> )	Data retrieved on 28/05/2017 Available online: <a href="http://www2.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.cfm">http://www2.aneel.gov.br/aplicacoes/capacidadebrasil/capacidadebrasil.cfm</a>	Others
/46/	Energy Sector Management Assistance Program (ESMAP) from the World Bank (WB).	Technical report titled “ <i>The Landfill Gas-to-Energy Initiative for Latin America and the Caribbean</i> ”	Dated: February/2006 Available online: <a href="https://openknowledge.worldbank.org/handle/10986/17972">https://openknowledge.worldbank.org/handle/10986/17972</a>	Others
/47/	Energy Sector Management Assistance Program (ESMAP) from the World Bank (WB).	Technical Report titled “ <i>Pre-Feasibility Study for Landfill Gas Recovery and Energy production at the Gramacho Landfill Rio de Janeiro, Brazil</i> ”	Dated: June/2005 Available online: <a href="http://s3.amazonaws.com/zanran_storage/www.bancomundial.org.ar/ContentPages/2469259978.pdf">http://s3.amazonaws.com/zanran_storage/www.bancomundial.org.ar/ContentPages/2469259978.pdf</a>	Others
/48/	UNFCCC	PDD for the CDM project activity “Bandeirantes Landfill Gas to Energy Project (BLFGE)” (UNFCCC registration no. 0164). version 2.B	Dated: 04/12/2005 Available online: <a href="http://cdm.unfccc.int/filestorage/X/A/N/XA/NOMNU4069Z0740KTNZUA3UG2WUOF/Bandeirantes%20PDD%20version%20B.pdf?t=SEI8b21wbDVnfDBqvJSu8adLklwwwBsga6LQ">http://cdm.unfccc.int/filestorage/X/A/N/XA/NOMNU4069Z0740KTNZUA3UG2WUOF/Bandeirantes%20PDD%20version%20B.pdf?t=SEI8b21wbDVnfDBqvJSu8adLklwwwBsga6LQ</a>	Others
/49/	UNFCCC	PDD for the CDM project activity “São João Landfill Gas to Energy Project (SJ) (BLFGE)” (UNFCCC registration no. 0373). version 2.B	Dated: 21/12/2005 Available online: <a href="http://cdm.unfccc.int/filestorage/O/O/8/OO/8YKJZUYG0VKO5SAESB30KIJZZRTL/O8YKJZU.pdf?t=Vnd8b21wbGU3fDAQeU1QbOAdfGzpDxiNbl7B">http://cdm.unfccc.int/filestorage/O/O/8/OO/8YKJZUYG0VKO5SAESB30KIJZZRTL/O8YKJZU.pdf?t=Vnd8b21wbGU3fDAQeU1QbOAdfGzpDxiNbl7B</a>	Others
/50/	UNFCCC	PDD for the CDM project activity “CTL Landfill Gas Project” (UNFCCC registration no. 5947). version 6.	Dated: 25/01/2012 Available online: <a href="http://cdm.unfccc.int/filestorage/T/C/W/TCWM3Y6LGQ9BEKAUHXF4NJV7R018D2/CTL_PDD_v6_2012_01_25_stc_FES.pdf?t=TFB8b21wb29lfDBQW4TqrA-pZ4_V5p2_qkfF">http://cdm.unfccc.int/filestorage/T/C/W/TCWM3Y6LGQ9BEKAUHXF4NJV7R018D2/CTL_PDD_v6_2012_01_25_stc_FES.pdf?t=TFB8b21wb29lfDBQW4TqrA-pZ4_V5p2_qkfF</a>	Others

/51/	Deloitte Touche Tohmatsu Limited	International tax, Brazil Highlights – 2016	Dated year 2016. Available online: <a href="https://www2.deloitte.com/br/en/pages/doing-business-brazil/articles/corporate-taxation.html">https://www2.deloitte.com/br/en/pages/doing-business-brazil/articles/corporate-taxation.html</a>	Others
/52/	UNFCCC/CDM-EB	Methodological tool “Investment analysis”, version 7.0 as per EB 92	Dated 04/11/2016. <a href="https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v7.0.pdf">https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v7.0.pdf</a>	Others
/53/	FXTOP company	Historical currency exchange rates Brazilian Real vs US Dollar	Available online: <a href="http://fxtop.com/en/historical-exchange-rates.php?A=1&amp;C1=USD&amp;C2=BRL&amp;MA=1&amp;DD1=01&amp;MM1=01&amp;YYYY1=2005&amp;B=1&amp;P=&amp;l=1&amp;DD2=31&amp;MM2=12&amp;YYYY2=2005&amp;btnOK=Go%21">http://fxtop.com/en/historical-exchange-rates.php?A=1&amp;C1=USD&amp;C2=BRL&amp;MA=1&amp;DD1=01&amp;MM1=01&amp;YYYY1=2005&amp;B=1&amp;P=&amp;l=1&amp;DD2=31&amp;MM2=12&amp;YYYY2=2005&amp;btnOK=Go%21</a>	Others
/54/	Brazilian Central Bank	Information on yields for the Brazilian Government Bond National Treasury Note, Series C (NTN-C), with maturity on January 1 <sup>st</sup> , 2031 for years 2003, 2004, 2005, 2006 and 2007 as published by the Brazilian Central Bank.	Dated from year 2003. Available online: Year 2003: <a href="http://www.tesouro.fazenda.gov.br/documentos/10180/546368/Tesouro+Direto+-+Balan%C3%A7o+dez+2003.pdf">http://www.tesouro.fazenda.gov.br/documentos/10180/546368/Tesouro+Direto+-+Balan%C3%A7o+dez+2003.pdf</a>  Year 2004: <a href="http://tesouro.gov.br/documents/10180/546490/Tesouro+Direto+-+Balan%C3%A7o+dez+2004.pdf/c62722c9-0561-439e-a328-5265a0320c34">http://tesouro.gov.br/documents/10180/546490/Tesouro+Direto+-+Balan%C3%A7o+dez+2004.pdf/c62722c9-0561-439e-a328-5265a0320c34</a>  Year 2005: <a href="http://tesouro.gov.br/documents/10180/546924/Tesouro+Direto+-+Balan%C3%A7o+dez+2005.pdf/db877722-9b39-4b66-9ac5-ea28f573813e">http://tesouro.gov.br/documents/10180/546924/Tesouro+Direto+-+Balan%C3%A7o+dez+2005.pdf/db877722-9b39-4b66-9ac5-ea28f573813e</a>  Year 2006: <a href="http://tesouro.gov.br/documents/10180/547086/Tesouro+Direto+-+Balan%C3%A7o+dez+2006.pdf/7413ef2">http://tesouro.gov.br/documents/10180/547086/Tesouro+Direto+-+Balan%C3%A7o+dez+2006.pdf/7413ef2</a>	Others

			<a href="http://5-4767-4d89-9d61-16cdb0a8231e">5-4767-4d89-9d61-16cdb0a8231e</a>  Year 2007: <a href="http://tesouro.gov.br/documents/10180/547347/Tesouro+Direto+-+Balan%C3%A7o+Anual+2007.pdf/77a38d53-78e5-4b76-90f6-8da036df34be">http://tesouro.gov.br/documents/10180/547347/Tesouro+Direto+-+Balan%C3%A7o+Anual+2007.pdf/77a38d53-78e5-4b76-90f6-8da036df34be</a>	
/55/	UNFCCC	PDD for the CDM project activity "Feira de Santana Landfill Gas Project" (UNFCCC registration no. 1626). Version 2.	Dated: 10/09/2007 Available online: <a href="http://cdm.unfccc.int/filestorage/V/J/7/VJ710470M3HI88WS5KL7YDFIHNL55G/revisioned%20PDD.pdf?t=Y3F8b21wbGxrfDADtHb2kGhclCA1fEwWkeIU">http://cdm.unfccc.int/filestorage/V/J/7/VJ710470M3HI88WS5KL7YDFIHNL55G/revisioned%20PDD.pdf?t=Y3F8b21wbGxrfDADtHb2kGhclCA1fEwWkeIU</a>	Others
/56/	UNFCCC	PDD for the CDM project activity "Exploitation of the biogas from Controlled Landfill in Solid Waste Management Central – CTRS / BR.040" (UNFCCC registration no. 3464). Version 2a.	Dated: 25/11/2009 Available online: <a href="http://cdm.unfccc.int/filestorage/U/7/S/U7SJ3BY0NXQV81GCT54DFWKL2HIA6E/R ef.%201%20-%20PDD%20CTRS%20BR.040%20002c%20%28version%202a%2025.11.2009%29?t=bTZ8b21wbHdwfDCN4LN-HM1H3UyRjKp8_0mr">http://cdm.unfccc.int/filestorage/U/7/S/U7SJ3BY0NXQV81GCT54DFWKL2HIA6E/R ef.%201%20-%20PDD%20CTRS%20BR.040%20002c%20%28version%202a%2025.11.2009%29?t=bTZ8b21wbHdwfDCN4LN-HM1H3UyRjKp8_0mr</a>	Others
/57/	Essencis Soluções Ambientais S.A.	Preliminary capital budgeting information for implementing a LFG collection and flaring infrastructure at the UVS - Caieiras landfill (values and assumptions from year 2004 and 2005)	Dated years 2004 and 2005	Project Participants
/58/	Brazilian Electricity Regulatory Agency (ANEEL)	Publicly available statistics for average purchasing price for grid-sourced electricity applicable for industrial grid-connected consumers in the Southeast region of Brazil in year 2004 and year 2005 and period from year 2007 to year 2015	Available online: <a href="http://relatorios.aneel.gov.br/layouts/xlviewer.aspx?id=/RelatoriosSAS/RelSampRegCC.xlsx&amp;Source=http://relatorios.aneel.gov.br/RelatoriosSAS/Forms/AllItems.aspx&amp;DefaultItemOpen=1">http://relatorios.aneel.gov.br/layouts/xlviewer.aspx?id=/RelatoriosSAS/RelSampRegCC.xlsx&amp;Source=http://relatorios.aneel.gov.br/RelatoriosSAS/Forms/AllItems.aspx&amp;DefaultItemOpen=1</a>	Others

/59/	STEMAC – Grupos Geradores	Specification sheet for electricity generator fuelled with Scania diesel engines with nameplate installed capacity of 700 kVA	Dated: September/2016 Available online: <a href="http://www.stemac.com.br/pt/produtos/Documents/Lâminas%20Diesel_SCANIA_SE T16.pdf">http://www.stemac.com.br/pt/produtos/Documents/Lâminas%20Diesel_SCANIA_SE T16.pdf</a>	Others
/60/	Termoverde Caieiras Ltda. / AB Energy do Brasil Ltda.	Engineering, Procurement and Commission (EPC) agreement established/signed between “Termoverde Caieiras Ltda.” and “AB Energy do Brasil Ltda.”	Dated 13/01/2015	Others
/61/	MICRO-EPSILON	ThermoMETER CTLaserCOMBUSTION / Non-contact infrared temperature sensors / IR sensor with laser sighting for measurements through & on flames – Instrument specification sheet	Dated 2017 <a href="http://www.micro-epsilon.com/temperature-sensors/thermoMETER_CT_laser/">http://www.micro-epsilon.com/temperature-sensors/thermoMETER_CT_laser/</a>	Others
/62/	Essencis Soluções Ambientais S.A.	Movie “UVS Caieiras Solução estratégica para São Paulo”	Dated: 06/2017 Available online: <a href="https://www.youtube.com/watch?v=i-FKsjd0V-M">https://www.youtube.com/watch?v=i-FKsjd0V-M</a>	Project participants
/63/	Essencis Soluções Ambientais S.A.	Internal documents and minutes of meetings referring to evaluations and discussions (from technical, economical and commercial perspectives) about the potential of promotion of utilization of collected LFG as fuel for electricity generation at the UVS-Caieiras landfill	Dated year 2014	Project participants
/64/	Termoverde Caieiras Ltda. / Essencis Soluções Ambientais	Master time plan for the implementation of electricity generation infrastructure located within the geographical limits of UVS-Caieiras landfill as valid in Feb./2015 and Jun./2016 and submitted to the Brazilian Electricity Regulatory Agency (ANEEL) and the São Paulo's state agency for electricity (ARSESP).	Dated Feb./2015 and Jun./2016	Project participants
/65/	ARSESP	Notification Report highlighting the status of the implementation project's new electricity generation infrastructure (final construction status) and also highlighting/acknowledging the relative implementation delay for such infrastructure (delay	Dated 27/01/2016	Others

		in the implementation of the power substation).		
/66/	AB Energy do Brazil Ltda.	Commissioning report for the electricity generation infrastructure fuelled by LFG located within the geographical limits of the UVS-Caieiras landfill	Dated 03/08/2016	Others
/67/	Brazil's national grid operator (ONS)	Official communication confirming that all 21 engine-generator sets of the project's new electricity generation infrastructure were regarded as under conformance with applicable requisites for connection to the National Electricity Grid of Brazil.	Dated 08/07/2016	Others
/68/	Government of Brazil, official press	Official journal of the Brazilian Government (Diário Oficial da União (DOU)) (Section 1) in which all 21 engine-generator sets of the electricity generation infrastructure located within the geographical limits of the UVS-Caieiras landfill were simultaneously released/approved for starting operating as power generation sources connected to the National Electricity Grid of Brazil	Dated 15/17/2016	Others
/69/	UNFCCC	Ruling note "Rationale for rejection of PRC-0171-004" (CDM-PA0171-RULE01)	Dated: 01/03/2018 Available online: <a href="https://cdm.unfccc.int/filestorage/e/x/t/extfile-20180305165234555-postreg_rule19.pdf/postreg_rule19.pdf?t=QXZ8cDh6N2tqfDB9edaTjbTW6wqRFMp0liYX">https://cdm.unfccc.int/filestorage/e/x/t/extfile-20180305165234555-postreg_rule19.pdf/postreg_rule19.pdf?t=QXZ8cDh6N2tqfDB9edaTjbTW6wqRFMp0liYX</a>	Others
/70/	UNFCCC	Report for the 99 <sup>th</sup> meeting of the CDM-Executive Board (CDM-EB)	Dated 26/04/2018 Available online: <a href="https://cdm.unfccc.int/filestorage/E/2/N/E2N1V4TWIYAG8HK5ZXBMRSP3Q9DF70/eb99_meeting_report.pdf?t=M2l8cDh6NmYxfDAgkGncYaetQFyg-mtr4SAM">https://cdm.unfccc.int/filestorage/E/2/N/E2N1V4TWIYAG8HK5ZXBMRSP3Q9DF70/eb99_meeting_report.pdf?t=M2l8cDh6NmYxfDAgkGncYaetQFyg-mtr4SAM</a>	Others
/71/	UNFCCC	Concept note Changes in the CDM project activity, PoA or CPA to be allowed as post-	Dated 04/07/2017 Available online: <a href="https://cdm.unfccc.int">https://cdm.unfccc.int</a>	Others

		registration changes (jointly completed by CDM Meth Panel and CDM Secretariat), version 1.0	<a href="#">/filestorage/O/R/Q/O RQFNC96DAW8TEK1YJS70V3MXHBG5L/eb96_propan03.pdf?t=T3d8cDh6N3o5fDChvGi3SU5QsgjevU0k9wyg</a>	
/72/	Essencis Soluções Ambientais S.A.	Monitoring Report for the CDM project activity “Caieiras landfill gas emission reduction” for the 14 <sup>th</sup> monitoring period from 01/07/2016 to 31/12/2016. Version 1.	Dated 25/11/2017 Available online: <a href="https://cdm.unfccc.int/Projects/DB/DNV-CUK1134509951.62/view">https://cdm.unfccc.int/Projects/DB/DNV-CUK1134509951.62/view</a>	Project participants
/73/	Essencis Soluções Ambientais S.A.	Monitoring Report for the CDM project activity “Caieiras landfill gas emission reduction” for the 15 <sup>th</sup> monitoring period from 01/01/2017 to 30/06/2017. Version 1.	Dated 17/10/2017 Available online: <a href="https://cdm.unfccc.int/Projects/DB/DNV-CUK1134509951.62/view">https://cdm.unfccc.int/Projects/DB/DNV-CUK1134509951.62/view</a>	Project participants
/74/	UNFCCC CDM Secretariat, EPIC, Essencis Soluções Ambientais S.A.	Phone call conducted on 27/03/2018 among members of the UNFCCC's CDM Secretariat, the members of the EPIC assessment and review and representative of the project participant Essencis Soluções Ambientais S.A. for the ruling CDM-PA0171-RULE01 as per provisions of para. 151 of CDM-PCP-PA (version 1.0).	Phone call held on 27/03/2018	Others
/75/	ISWA / UNEP	Global Waste Management Outlook – 2015	Dated year 2015. Available online: <a href="https://www.uncclearn.org/sites/default/files/inventory/unep23092015.pdf">https://www.uncclearn.org/sites/default/files/inventory/unep23092015.pdf</a>	Others
/76/	UNFCCC	Methodological tool “Emissions from Solid Waste Disposal Sites” (version 08.0)	Dated 04/05/2017 Available online: <a href="https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.0.pdf">https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.0.pdf</a>	Others



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

**Table 1. CL from this validation**

<b>CL ID</b>	1	<b>Section no.</b>	D.7.	<b>Date:</b> 22/10/2017
<b>Description of CL</b>				
Further details and/or documented evidences about the occurred construction, commissioning date and starting of operations of the electricity generation infrastructure (including milestone dates for the relevant facts/aspects as well as details about the occurred unforeseen delay in the conclusion of the construction of the infrastructure) are to be provided.				
<b>Project participant response</b>				<b>Date:</b> 23/10/2017
As a response to the raised CL, the revised PDD was amended accordingly in Section A.3 and additional documented evidences were provided.				
<b>Documentation provided by project participant</b>				
<ul style="list-style-type: none"> <li>- Copies of the versions of the master time plan for the implementation of the electricity generation infrastructure valid in Dec./2014 and Jun./2016 issued by Termoverde Caieiras Ltda. and submitted to both the Brazilian Electricity Regulatory Agency (ANEEL) and the São Paulo's state agency for electricity (ARSESP). As appropriately outlined in the revised PDD, the comparison of these different versions of the time plan allows confirmation of the previously unforeseen/unexpected delay on conclusion of the construction and commissioning work for the electricity generation infrastructure).</li> <li>- Copy of Notification Report issued by ARSESP on 27/01/2016 highlighting the status of the implementation of the electricity generation infrastructure (final construction status) and also highlighting/acknowledging the relative implementation delay for such infrastructure (delay in the implementation of the power substation).</li> <li>- Copy of commissioning report for the electricity generation infrastructure issued by AB Energy do Brazil Ltda. on 03/08/2016 (commissioning work held on 11/07/2016).</li> <li>- Copy of official communication issued by the Brazil's national grid operator (ONS) dated 08/07/2016 confirming that all its 21 engine-generator sets of the electricity generation infrastructure were regarded as under conformance with applicable requisites for connection to the National Electricity Grid of Brazil.</li> <li>- Copy of the official Journal of the Brazilian Government (Diário Oficial da União (DOU)) of 15/07/2016 (Section 1) in which all 21 engine-generator sets of the electricity generation infrastructure were simultaneously released/approved for starting operating as power generation sources connected to the National Electricity Grid of Brazil.</li> </ul>				
<b>DOE assessment</b>				<b>Date:</b> 02/11/2017

As confirmed by the EPIC assessment team, related performed amendments/corrections in Sections A.3 in the revised PDD sufficiently and correctly address the raised CL. Added information is under full conformance with provided documented evidences. This CL is closed.

**Table 2. CAR from this validation**

CAR ID	1	Section no.	D.6	Date:	13/05/2017
<b>Description of CAR</b>					
Specification details for the backup captive off-grid electricity generator (installed as a permanent post-registration change in the project design) are missing in the context of the selection of the value for the ex-ante determined parameter "Rated capacity of the installed captive backup electricity generator fuelled by diesel" ( $PP_{CP, Diesel-generator}$ ).					
<b>Project participant response</b>					<b>Date:</b> 01/08/2017
As a response of the raised CAR, Section B.6.2 was amended accordingly in the revised PDD.					
<b>Documentation provided by project participant</b>					
No additional documentation was provided.					
<b>DOE assessment</b>					<b>Date:</b> 02/08/2017
As confirmed by the EPIC assessment team, related performed corrections/improvements in Section B.6.2 in the revised PDD sufficiently address the raised CAR. This CAR is thus closed. <u>Note:</u> As also confirmed by the EPIC assessment team, the parameter "Rated capacity of the installed captive backup electricity generator fuelled by diesel" ( $PP_{Diesel-generator}$ ) is correctly not any longer included as an ex-ante selected parameter in the version of the PDD addressing CAR 3. Option B.4 is correctly not anymore applied/considered for the determination of project emissions due to consumption of electricity sourced by the installed backup captive generator. This is under conformance with applicable guidance for Case C.III of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1).					

**Table 3. CAR from this validation**

CAR ID	2	Section no.	D.5	Date:	13/06/2017
<b>Description of CAR</b>					
As outlined in the Ruling note "Rationale for rejection of PRC-0171-004" (CDM-PA0171-RULE01) (that was previously issued by the CDM Executive Board (CDM-EB) on 01/03/2018 as an outcome of the rejection by this board of a previously submitted request of approval of post-registration changes for the project activity in September/2017 - under PRC ref. PRC-0171-004), the project design description (under its revised design configuration) and its demonstration of eligibility are presented in the revised PDD not under conformance with applicable CDM rules.					
<b>Project participant response</b>					<b>Date:</b> 01/08/2017
As a response of the raised CAR, the whole project design description (incl. definition of GHG abatement measures, project boundaries, baseline scenario, etc.) was revised by inter alia taking into account the following explicit decision from the CDM-EB (as presented in the Ruling note "Rationale for rejection of PRC-0171-004" (CDM-PA0171-RULE01)): <i>"The PP/DOE may wish to submit a post registration change to reflect the actual implementation of the project activity and continue claiming CERs from the landfill gas (LFG) capture and destruction (...)"</i>					
<b>Documentation provided by project participant</b>					
No additional documentation was provided.					
<b>DOE assessment</b>					<b>Date:</b> 02/08/2017

It is the opinion of the EPIC assessment team that the revised PDD sufficiently and correct takes into account all remarks and considerations from Ruling note "Rationale for rejection of PRC-0171-004" (CDM-PA0171-RULE01). The whole content of "Box 2c - Rationale for non-inclusion of electricity generation as additional GHG abatement measure as part of the project activity + non-accounting of emission reductions associated to displacement of a more-GHG-intensive service (i.e. CO<sub>2</sub> emission reductions due to generation of electricity using collected LFG as renewable energy source)" in Section A.3 of the revised PDD sufficiently explains and justifies the eligibility of the project activity under its revised design configuration vis-à-vis all applicable CDM rules.

In summary, related performed corrections/improvements in different sections of the revised PDD sufficiently address the raised CAR. This CAR is thus closed.

**Table 4. CAR from this validation**

CAR ID	3	Section no.	D.6	Date: 20/07/2018
<b>Description of CAR</b>				
While both grid-sourced electricity and electricity generated by a backup captive off-grid electricity generator (fuelled by diesel) are used for meeting the project's electricity demand, the selected Scenarios of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1) are not valid for both of these electricity sources.				
<b>Project participant response</b>				<b>Date: 20/07/2018</b>
As a response of the raised CAR, the PDD was amended in order to have the determination of project emissions due to consumption of electricity being determined by following applicable guidance of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1) valid for Scenario C (Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s)) with Case C.III (Electricity from both the grid and captive power plant(s)) being selected as a generic approach. It is relevant to note that the backup electricity generator installed in July/2016 is activated automatically (through automatic switching control) whenever supply of grid-sourced electricity to the project activity is interrupted. The available automatic switching control for the generator does not allow the backup electricity generator to be connected to the electricity grid. Thus, under no circumstance the project's electricity demand can be met simultaneously by grid-sourced electricity and by backup electricity generator (fuelled by diesel). It is also relevant to note that, while the project activity is connected to a very stable and reliable electricity transmission/distribution lines, since its installation of in July/2016, the backup captive off-grid electricity generator (fuelled by diesel) has not been utilized since its installation (with exception of testing/commissioning event and preventive maintenance procedures when it is manually turned on for very short instants without having electricity being supplied to project activity). Anyhow, for sake of conservativeness case C.III is selected as a generic approach. Within a specific monitoring period along the 2 <sup>nd</sup> 7-year crediting period, in case it is confirmed that the installed backup captive off-grid electricity generator (fuelled by diesel) was not used during the period in question, project emissions due to the consumption of electricity from such backup captive generator will thus directly be determined as null/zero and, under this circumstance, Case C.I (Grid Electricity) may be considered as an alternative for the ex-post determination of project emissions due to consumption of grid-sourced electricity by the project activity within such period under Scenario C (with direct application of option A.1 or A.2 of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1) for the ex-post determination of $EF_{EL,grid,y}$ as established by guidance of tool for Case C.I).				
<b>Documentation provided by project participant</b>				
No additional documentation was provided.				
<b>DOE assessment</b>				<b>Date: 25/07/2017</b>
As confirmed by the EPIC assessment team, related performed corrections in the revised PDD sufficiently address the raised CAR. This CAR is thus closed.				
<u>Note:</u> As also confirmed by the EPIC assessment team, the parameter "Rated capacity of the installed captive backup electricity generator fuelled by diesel" ( $PP_{Diesel-generator}$ ) is correctly not any longer included as an ex-ante selected parameter in the version of the PDD addressing CAR 3. Option B.4 is correctly not anymore applied/considered for the determination of project emissions due to consumption of electricity sourced by the installed backup captive generator. This is under conformance with applicable guidance for Case C.III of the methodological tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 1).				

Table 5. FAR from this validation

<b>FAR ID</b>		<b>Section no.</b>		<b>Date:</b> DD/MM/YYYY
<b>Description of FAR</b>				
<b>Project participant response</b>				<b>Date:</b> DD/MM/YYYY
<b>Documentation provided by project participant</b>				
<b>DOE assessment</b>				<b>Date:</b> DD/MM/YYYY

## Appendix 5. Additional assessment details

This Appendix includes EPIC additional assessment details about the following aspects:

- Determination of the baseline scenario for the project activity (under its revised design configuration)
- Performance of the Common practice analysis (as a credibility check in the context of the assessment that the previously demonstrated additionality of the project activity is not undermined by the occurred and yet to occur (planned) permanent changes in the project design)

### 1. Further assessment of the determination of the baseline scenario for the project activity under its revised design configuration (i.e. including the project's new electricity generation infrastructure)

Section B.4 of the revised PDD <sup>/2/</sup> appropriately includes a revised/complemented application of the whole previously applied stepwise approach of the latest version of methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period". Such revised/complemented application of stepwise approach aims to confirm and demonstrate the identification of the baseline scenario for methane emissions for the project activity under its revised design configuration, thus meeting the applicable particular requirement from the CDM project standard for project activities (CDM-PS-PA) <sup>/18/</sup> for addressing post-registration changes in the design of a previously registered CDM project activity. Section B.4 of the revised PDD <sup>/2/</sup> thus correctly includes the whole determination of the baseline scenario for the project activity (under its revised design configuration) by following the applicable guidance and stepwise procedure of ACM0001 (version 13.0.0) <sup>/7/</sup>.

As part of the correct application of the stepwise approaches of both the methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" (version 03.0.1) <sup>/21/</sup> (i.e. complementing the previous application of the tool as part of the compilation of the updated PDD in the context of the renewal of the 7-year crediting period for the project activity) and the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0.0); and by also related following the stepwise approach of ACM0001 (version 13.0.0) <sup>/7/</sup>, baseline alternatives for the project activity (under its revised design configuration) are identified.

As part of the application of Step 1 of ACM0001 (version 13.0.0) <sup>/7/</sup>, it is also correctly highlighted that there are still no legal restrictions or requirements/obligations for utilizing collected LFG for generation of electricity (or any other type of LFG utilization) in Brazil.

As a result of the deemed correct application of the further steps of the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0.0) <sup>/22/</sup> and by fully considering applicable approach of ACM0001 (version 13.0.0) <sup>/7/</sup> in the context of the identification of the baseline scenario and assessment/demonstration of additionality of the project activity (under its revised design configuration) (as presented in Section B.5 of the revised PDD <sup>/2/</sup> and assessed below and in Section D.7), the following is sufficiently concluded/demonstrated in the revised PDD <sup>/2/</sup>:

Alternative LFG1 (*"The proposed project activity undertaken without being registered as a CDM project activity"*) does not represent baseline alternatives.

Thus, the baseline alternative for the project activity (under its revised design configuration) is identified as being the following alternative:

- LFG2 (*"Atmospheric release of the LFG or partial capture of LFG and destruction to comply with regulations or contractual requirements, or to address safety and odors concerns"*).

While ACM0001 (version 13.0.0) establishes that, in addition to the alternative baseline scenarios identified for the destruction of LFG, alternative scenarios for the utilization of LFG shall also be identified in case this is an aspect of the project activity. Since, as part of the operation of the project activity, electricity generation using LFG as fuel is not included as an additional GHG abatement measure for the project activity, no baseline emissions for generation of electricity is thus identified.

In summary, as an outcome of the complete application of guidance of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0) <sup>/22/</sup> and ACM0001 (version 13.0.0) <sup>/7/</sup>, it is sufficiently demonstrated the following in the revised PDD <sup>/2/</sup>:

- The baseline scenario for the project activity (in terms of emissions of methane) remains being identified as the atmospheric release of the LFG with minor share of generated LFG being partially collected and destroyed in conventional/rudimentary passive LFG venting/combustion drains (available in the pre-project scenario) in order to address safety and odors concerns at the UVS - Caieiras landfill<sup>15</sup>.

It is EPIC opinion that the demonstration of the baseline scenario for the project activity under its revised design configuration is correctly performed.

It is also the opinion of the EPIC assessment team that the way Sections B.4 and B.5 of the PDD were revised (in the particular context of the determination of the baseline scenario) is deemed acceptable and correct.

In summary, as a result of application of Step 2 – Barrier analysis, the alternative encompassing the implementation of the project activity (under its revised design configuration) (baseline alternative LFG1) is demonstrated as prevented by barriers. Previously identified and assessed barriers are sufficiently demonstrated as still valid/applicable for the project activity (under its revised design configuration).

## **2. Assessment of the content of the timeline included in Section A.3 of the revised PDD with facts and events related to the implementation of the grid-connected electricity generation infrastructure fuelled by LFG and located within the geographical limits of the UVS – Caieiras landfill under its 1<sup>st</sup> implementation phase and its starting of operations in July/2016**

The table below includes assessment details for dates and descriptions of relevant facts/events related to the implementation of the grid-connected electricity generation infrastructure located within the geographical limits of the UVS – Caieiras landfill as outlined in Section A.3 of the revised PDD <sup>/2/</sup>.

<sup>15</sup> It is relevant to note that the following is outlined in Section B.6.1. of both currently registered and revised versions of the PDD regarding destruction of methane in the absence of the project activity:

*"(...) in the absence of the project activity, it is acknowledged that a small and non-defined share of generated LFG would be expected to be collected and vented and/or destroyed through combustion in a set of conventional passive LFG venting/combustion drains in order to appropriately address safety and odor concerns under the baseline scenario."*

*Table App. 5 -3: Assessment for dates and descriptions the relevant facts/events related to the the implementation of the grid-connected electricity generation infrastructure (under its implementation phase 1) (as outlined in Section A.3 of the revised PDD).*

Date and description of the relevant fact/event related to the incurrence (in year 2015) of the earliest and major capital expenditures for implementing the project's new electricity generation infrastructure (under phase 1)	EPIC assessment
<p>Year 2014:</p> <p><i>"As a result of the operation of the project activity (as a LFG collection and flaring initiative) for more than 8 years, the project's operational and management staff from the project participant Essencis Soluções Ambientais S.A. finally managed to develop significant expertise and competence in terms of LFG collection techniques (under the very high volumes applicable for a very large landfill site such as the UVS - Caieiras landfill).</i></p> <p><i>Right in the beginning of year 2014, Essencis Soluções Ambientais S.A. and the company Solvi Valorização Energética (SVE) initiated the development of further internal field studies and technical and commercial investigations for the implementation of a grid-connected electricity generation infrastructure to be powered by LFG and be located within the geographical limits of the UVS – Caieiras landfill . Such investigations occurred after the effective renewal of the 7-year crediting period for the project activity. At that time, the following technical operational aspects and conditions inter-alia represented crucial and/or very relevant aspects/facts in the context of related capital expenditures and investment decision making process for implementing such electricity generation infrastructure:</i></p> <ul style="list-style-type: none"> <li>- <i>Achievement of reduced uncertainty level about the quantity and quality of LFG collected at the UVS - Caieiras landfill. This was a direct result of development by Essencis Soluções Ambientais S.A. of real field expertise and competence in terms of collection of LFG (after the project activity being operated as a LFG collection and destruction initiative since year 2007).</i></li> <li>- <i>Development of market and technical competence in the host country Brazil for the promotion of utilization of LFG as gaseous fuel for electricity generation (incl. occurred real improvements in terms of conversion efficiency of engine-generator units, use of more advanced electronics for dealing with usual fluctuations in CH<sub>4</sub> content/fraction in LFG, reduction of problems of synchronization of engine-generator sets within the electricity grids, etc.).</i></li> <li>- <i>More attractive sale price for generated electricity in Brazil (when compared to sale price previously considered at the time of occurred project initial design conceptualization + CDM consideration (within years 2004 and 2005)).</i></li> <li>- <i>Reduction in the previously existent policy, technical requirements and market uncertainties within the Brazilian power market.</i></li> <li>- <i>Overall historical slight improvement in macroeconomic conditions in Brazil</i></li> </ul> <p><i>It is relevant to note that in year 2014, the project activity was</i></p>	<p>Representatives of the project participant Essencis Soluções Ambientais S.A. were interviewed by the EPIC assessment team and it was confirmed that Essencis Soluções Ambientais S.A. and the company Solvi Valorização Energética (SVE) indeed initiated the development of further internal field studies and investigations related to the utilization of LFG as gaseous fuel for electricity generation during year 2014 (year after the starting of operations of the project activity under its previous design configuration).</p> <p>As argued by interviewed representatives of Essencis Soluções Ambientais S.A., by year 2014, the confirmation of possibility of maintenance of potential carbon revenues indeed played an instrumental role in incurrence of capital expenditures for implementing the grid-connected electricity generation infrastructure.</p> <p>A set of internal documents and minutes of meetings<sup>/63/</sup> referring to performed evaluations and discussions (from technical, economical and commercial perspectives) about the potential of promotion of utilization of collected LFG as fuel for electricity generation at the UVS - Caieiras landfill were made available and were reviewed by the EPIC assessment team. These internal documents were all confirmed as being issued in year 2014.</p> <p>In summary, based on assessed documented evidences, EPIC was able to confirm that information reported in Section A.3 of the revised PDD<sup>/2/</sup> regarding the reasons and rationale for implementing the electricity generation infrastructure is correct.</p>

<p><i>already registered under its 2<sup>nd</sup> 7-year crediting period"</i></p>	
<p>13/01/2015:</p> <p><i>"As the main outcome of all performed investigations for the implementation of the grid-connected electricity generation infrastructure fuelled by LFG and located within the geographical limits of the UVS – Caieiras landfill , a technical solution involving the installation of container-based modular engine-generator packages (with engine-generator sets manufactured/supplied by the American/Austrian power generation equipment manufacturer GE Jenbacher GmbH &amp; Co OHG) was regarded as the most appropriate and technically sound option.</i></p> <p><i>On 13/01/2015, an Engineering, Procurement and Commission (EPC) agreement was established/signed between the incorporated/registered company "Termoverde Caieiras Ltda." and the company AB Energy do Brasil Ltda. (representative in Brazil for the Italy headquartered company AB Energy SPA) for the gradual/phased implementation of the grid-connected electricity generation infrastructure fuelled by LFG under 3 implementation phases.</i></p> <p><i>The established technical EPC agreement encompassed design, phased construction, commissioning and operation (under a "turnkey" business model) of a state-of-the-art electricity generation infrastructure with 37.8 MW of total and final combined installed capacity.</i></p> <p><i>The establishment of such agreement was occurred in the context of the project activity registered under the CDM for more than 7 years."</i></p>	<p>The EPIC assessment team reviewed the Engineering, Procurement and Commission (EPC) agreement established/signed between the incorporated/registered company "Termoverde Caieiras Ltda." and the company AB Energy do Brasil Ltda. (representative in Brazil for the Italy headquartered company AB Energy SPA) <sup>/60/</sup>. Based on such assessed documented evidence, EPIC was able to confirm that information reported in Section A.3 of the revised PDD <sup>/2/</sup> regarding the timing of the earliest and major capital expenditures for implementing the project's new electricity generation infrastructure is correct.</p>
<p>February 2015:</p> <p><i>"Starting of the construction work for the grid-connected electricity generation infrastructure in an area in the UVS - Caieiras landfill (next to the project's LFG flaring infrastructure under its current location) (initial of minor construction work (access, topography work, etc.)) with procurement of all major equipment being in progress with AB Energy SPA from Italy as established in the EPIC agreement established/signed between the Termoverde Caieiras Ltda. and AB Energy do Brasil Ltda."</i></p>	
<p>Period within year 2015 and July 2016:</p> <p><i>"Milestone for the construction and commissioning tasks for the grid-connected electricity generation infrastructure fuelled by LFG and located within the geographical limits of the UVS – Caieiras landfill :</i></p> <p><i>Civil construction:</i></p> <ul style="list-style-type: none"> <li>- <i>Foundations for the plant control house and foundations for the 21 engine-generator sets: from Feb./2015 to Oct./2015</i></li> <li>- <i>Construction of the power substation (incl. firefighting equipment): from Jun./2009 to Sep./2010</i></li> </ul>	<p>The following documented evidences (including documents issued by 3<sup>rd</sup> parties) (which were made available and reviewed by the EPIC assessment team) confirm the correctness and appropriateness of the reported milestone for the implementation of the project's new electricity generation infrastructure during the period from Feb./2015 to Jul./2016:</p>



*Electrical and power control system:*

- Installation of the 21 engine-generator sets + ancillary and control system (without testing/commissioning): from Jul./2015 to Oct./2015

*Power substation:*

- Construction of power station: from Oct./2015 to Jun./2016

*Testing and commissioning for the whole infrastructure: from Jun./2016 to early Jul./2016.*

*In January/2016, based on the outcome of its performed surveillance, the São Paulo's state agency for electricity "Agência Reguladora de Saneamento e Energia do Estado de São Paulo" (ARSESP) has issued a Notification Report highlighting the status of the implementation the electricity generation infrastructure (final construction status) and also highlighting the relative implementation delay for such infrastructure (delay in the implementation of the power substation). As per the report, while as per the initial official time plan for the implementation of the electricity generation infrastructure, the power substation was forecasted to be built within the period from Feb./2015 to Oct./2015, by Jan./2016 its construction was not yet completed.*

*Upon difficulties of the conclusion of the power substation (that were caused by delays in the licensing/permit for its installation as a power station connected to a regional 128 kV power transmission line) the construction and assembly of the power substation connecting the electricity generation infrastructure to the electricity grid was delayed.*

*As outlined in an official communication issued by the Brazil's national grid operator is termed Operador Nacional do Sistema (ONS) dated 08/07/2016, upon positive outcome of performance surveillance in the electricity generation infrastructure, all its 21 engine-generator sets were regarded as under conformance with applicable requisites for connection to the National Electricity Grid of Brazil.*

*As published in the Diario Oficial da União (DOU) of 15/07/2016 (Section 1) , all 21 engine-generator sets of the electricity generation infrastructure located within the geographical limits of the UVS – Caieiras landfill were simultaneously released/approved for starting operating as power generation sources connected to the National Electricity Grid of Brazil."*

- Copies of the versions of the master time plan for the implementation of the electricity generation infrastructure valid in Dec./2014 and Jun./2016 issued by Termoverde Caieiras Ltda. and submitted to both the Brazilian Electricity Regulatory Agency (ANEEL) and the São Paulo's state agency for electricity (ARSESP) <sup>/64/</sup>.
- Copy of Notification Report issued by ARSESP on 27/01/2016 highlighting the status of the implementation of the electricity generation infrastructure (final construction status) and also highlighting/acknowledging the relative implementation delay for such infrastructure (delay in the implementation of the power substation) <sup>/65/</sup>.
- Copy of commissioning report for the electricity generation infrastructure issued by AB Energy do Brazil Ltda. on 03/08/2016 (commissioning work held on 11/07/2016) <sup>/66/</sup>.
- Copy of official communication issued by the Brazil's national grid operator (ONS) dated 08/07/2016 confirming that all its 21 engine-generator sets were regarded as under conformance with applicable requisites for connection to the National Electricity Grid of Brazil <sup>/67/</sup>.
- Copy of the official Journal of the Brazilian Government (Diario Oficial da União (DOU)) of 15/07/2016 (Section 1) in which all 21 engine-generator sets of the project's new electricity generation infrastructure were simultaneously released/approved for starting operating as power generation sources connected to the National Electricity Grid of Brazil <sup>/68/</sup>.

<p>01/07/2016, 08/07/2016 and 11/07/2016:</p> <p><i>“01/07/2016: Connection of the set of internal combustion gas engines (additional/alternative methane destruction devices for the project activity) to the project’s main LFG supply pipeline, thus technically allowing collected LFG to be sent to such project’s new infrastructure for being combusted.</i></p> <p><i>08/07/2016: Starting of operations of the set of internal combustion gas engines.</i></p> <p><i>11/07/2016: Upon conclusion of all related testing and commissioning activities for the grid-connected electricity generation infrastructure and upon conclusion of all required configuration of the project’s monitoring data gathering, processing and recording system; continuous operation of the project activity (with all required monitoring data being measured, processed and recorded) has started under its revised configuration (with the set of 21 internal combustion gas engines acting as additional/alternative methane destruction devices).</i></p> <p><u><i>Note: Unforeseen/unexpected delay on conclusion of the construction and commissioning work for the grid-connected electricity generation infrastructure (for which the set of internal combustion gas engines represents major components):</i></u></p> <p><i>Due to difficulties and problems with tasks/activities related to equipment procurement unforeseen/unexpected, construction, testing and commissioning phases for the grid-connected electricity generation infrastructure fuelled by LFG, its starting of operations was delayed when compared to previously made forecasts:</i></p> <ul style="list-style-type: none"> <li><i>- while the grid-connected electricity generation infrastructure was previously forecasted to start operating in the beginning of year 2016, its continuous operations was initiated on 11/07/2016 (about 6 months or ½ year of delay).</i></li> </ul> <p><i>As established in the contractual agreement established between Termoverde Caieiras Ltda. and the company AB Energy do Brasil Ltda., the starting of operations for the 2<sup>nd</sup> and 3<sup>rd</sup> implementation phases of the grid-connected electricity generation infrastructure fuelled by LFG (that will represent increment in its total combined installed capacity of 5.6 MW and 2.8 MW respectively) are currently expected to occur in years 2019 and 2020 respectively.</i></p>	<p>The EPIC assessment team has reviewed available monitoring data for the operation of the project activity as reported in previously issued, verified and approved Monitoring Reports for previously performed verifications of the project activity. Monitoring data for July/2016 was also reviewed by the EPIC assessment team.</p> <p>Furthermore, as confirmed by the EPIC assessment team, records from the ANEEL’s database/registry of grid-connected power generation sources under operation in Brazil (Banco de Informações de Geração - BIG) clearly indicate that the power generation enterprise “Termoverde Caieiras” (power generation source with ANEEL registration code UTE.RU.SP.031436-6.01)<sup>/45/</sup> started continuous and monitored operations on 11/07/2016 under a declared/confirmed nameplate installed capacity of 29.4 MW.</p> <p>In summary, based on assessed documented evidences, EPIC was able to confirm that information reported in Section A.3 of the revised PDD<sup>/2/</sup> regarding starting of operations of the electricity generation infrastructure is correct.</p>
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In summary, assessment details included in the table above confirms that dates and descriptions of the relevant fact/event related to the incurrence (in year 2015) of the earliest and major capital expenditures for implementing the electricity generation infrastructure located within the geographical limits of the UVS – Caieiras landfill (under its initial phase), as outlined in Section A.3 of the revised PDD<sup>/2/</sup>, are deemed reasonable and correct.

The EPIC assessment team acknowledges that, as appropriately argued by the representatives of the project participant Essencis Soluções Ambientais S.A., it is relevant to note that all events/facts related to the implementation of the electricity generation infrastructure have all occurred or will occur in a context with the project activity already being registered under the CDM. Thus, EPIC acknowledges that, as argued by the representatives of the project participant, there was no

additional CDM consideration is involved in such occurred and yet to occur (planned) incurrence of capital expenditures for gradually implementing the 3-phase electricity generation infrastructure.

**3. Further assessment for the performance of the Common practice analysis (as an additional credibility check in the context of the demonstration that the previously assessed additionality of the project activity is not undermined by the permanent changes in the project design)**

Step 4 “Common Practice Analysis” of the “Tool for the demonstration and assessment of additionality” (version 07.0.0) <sup>/3/</sup> is applied as outlined in Section B.5 of the revised PDD <sup>/2/</sup> as a credibility test to demonstrate the extent to which the project activity (under its revised design configuration) is diffused in the relevant sector. The common practice analysis is performed as a credibility check (regardless of the fact that applicable guidance of the CDM project standard for project activities (CDM-PS-PA) (version 01.0) <sup>/18/</sup> does not explicitly refer to the performance of Common practice analysis as a requirement for addressing post-registration changes in the project design). As argued by the representatives of the project participant Essencis Soluções Ambientais S.A., the common practice analysis is performed as an additional step to demonstrate that the previously assessed and demonstrated additionality of the project activity is indeed not undermined by the changes in its design configuration. This is deemed reasonable and acceptable in the opinion of the EPIC assessment team.

In the context of the performed common practice analysis, applicable guidance of the latest version of the methodological tool “Common practice” (version 03.1) <sup>/24/</sup> is correctly considered in the context of application of Sep 4a of the “Combined tool to identify the baseline scenario and demonstrate additionality” (version 06.0.0) <sup>/22/</sup>.

*Step 4a . The proposed CDM project activity(s)<sup>16</sup> applies measure(s) that are listed in the definitions section above*

As correctly outlined in the revised PDD <sup>/2/</sup>, the project activity (under its revised project design) comprises methane destruction as its unique GHG abatement measure. While “*Methane Destruction*” is explicitly listed in the definition section of the latest version of the methodological tool “Common practice” (version 03.1) <sup>/24/</sup> as a “*measure*”, Step 4a of the “Combined tool to identify the baseline scenario and demonstrate additionality” is thus correctly applied. As confirmed by the EPIC assessment team, this is under conformance with the stepwise approach of the methodological tool “Common practice” <sup>/24/</sup>.

*Application of the stepwise approach of the methodological tool “Common practice”:*

*Step 1: Calculate applicable output range as  $\pm 50\%$  of the design output or capacity of the proposed project activity:*

In the context of the performed common practice analysis, the applicable geographical area for the analysis is correctly defined as the whole host country Brazil. Furthermore, in the context of the application of Step 1, the determination of the total design capacity or output in terms of methane destruction of project activity (as required by applicable guidance of the methodological tool “Methodological tool “Common practice” (version 03.1)) is not plausible/applicable.

As an alternative approach, taking into account the nameplate installed capacity of the grid-connected electricity generation infrastructure located within the geographical limits of the UVS –

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<sup>16</sup> As appropriately outlined in the revised PDD <sup>/2/</sup>, in the context of the application of the stepwise procedure of the methodological tool “Common practice” (version 03.1) <sup>/24/</sup> for assessing potential impact of the permanent post-registration changes in the project design over the previously demonstrated additionality for the project activity, the term “*proposed CDM project activity*” actually refers to the registered project activity.

Caieiras landfill (for which the set of internal combustion gas engines combusting LFG (regarded as additional/alternative methane destruction devices) represents the major components) as if the project activity were encompassing electricity generation as an additional GHG abatement measure, the applicable capacity or output range for the project activity (under its revised design configuration) could thus be calculated as follows:

- Total combined design nameplate power generation capacity (output) of the project activity (under its revised design configuration and at the last implementation phase for its electricity generation infrastructure): 37.8 MW
- Calculated applicable output range (as per applicable guidance of the methodological tool "Common practice" <sup>/24/</sup>): from 18.9 MW to 56.7 MW

It is the opinion of the EPIC assessment team that Step 1 is applied in a deemed acceptable manner by taking into account the specific case of the project activity under its revised design configuration.

*Step 2: Identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:*

- (a) The projects are located in the applicable geographical area;*
- (b) The projects apply the same measure as the proposed project activity;*
- (c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;*
- (d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;*
- (e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;*
- (f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.*

As assessed by the EPIC assessment team, in the context of the application of Step 2, similar initiatives that fulfil characteristics/aspects below are correctly identified as follows (by taking into consideration the alternative approach applied under Step 1):

- Initiatives located in the host-country Brazil;
- Initiatives that promote methane destruction through LFG flaring and/or utilization of collected LFG as gaseous fuel for electricity generation (initiatives that generate electricity through the utilization of LFG);
- Initiatives within the calculated range of nameplate power generation installed capacity (output) from 18.9 MW to 56.7 MW;
- Initiatives that started commercial operation prior to the performed global stakeholder consultation for the project activity on 04/12/2004<sup>17</sup>;

As confirmed by the EPIC assessment team, at the time of the occurred project initial design conceptualization and prior to the period when the CDM global stakeholder consultation for the project activity was performed (period from 04/12/2004 to 03/01/2005), there only one initiative (under operation and/or under construction/commissioning) promoting LFG collection and destruction and LFG utilization as fuel for electricity generation in the whole host country Brazil.

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<sup>17</sup> As appropriately outlined the revised PDD <sup>/2/</sup>, the previously issued Validation Report for the project activity (dated 12/12/2005) <sup>/32/</sup> states that the initial version of the PDD was webhosted at the website of the DOE in charge of the validation assessment and stakeholders were invited to provide comments within the 30 days period from 04/12/2004 to 03/01/2005.

As correctly outlined in the revised PDD <sup>/2/</sup> and confirmed by the EPIC assessment team through search of information made available at the UNFCCC CDM website, the CDM project “Bandeirantes Landfill Gas to Energy Project (BLFGE)” (UNFCCC reg. no. 0164)<sup>18</sup> was indeed the only initiative promoting destruction and utilization of LFG under operation in Brazil at that time.

The EPIC assessment team is also aware and was thus able to confirm that, as claimed in the revised PDD <sup>/2/</sup>, in the particular case of the host country Brazil, the CDM played a singular role for the implementation of LFG collection and destruction/utilization initiatives in landfills across the whole country since the time of the project initial design conceptualization (within years 2004 and 2005) onwards (with the CDM triggering the implementation of all of the limited number of such initiatives across in the whole country).

As also confirmed by the EPIC assessment team, this particular situation is still valid nowadays, all initiatives promoting LFG collection and destruction/utilization under operation, construction and/or with expected/forecasted future implementation and operation in the host country Brazil were indeed registered (or under validation) as CDM project activities as appropriately highlighted in the revised PDD <sup>/2/</sup>.

The revised PDD <sup>/2/</sup> includes a comprehensive list including the 56 initiatives registered or under validation as CDM project activities and 1 initiative registered as a Programme of Activities (PoA) that promote or are planned/forecasted to promote LFG collection and destruction and/or utilization (as fuel for electricity or thermal energy (steam) generation or through supply of compressed/liquefied LFG to user(s) using trucks) in the host-country Brazil (including the CDM project activity “Caieiras landfill gas emission reduction”). The list included in the revised PDD <sup>/2/</sup> includes not only registered CDM project activities but also initiatives yet under CDM validation stage.

Among all currently implemented (built and under operation) initiatives promoting LFG collection and destruction + utilization of collected LFG as gaseous fuel for electricity generation hosted in Brazil, the revised PDD <sup>/2/</sup> correctly points out that only 3 of the so far implemented initiatives have nameplate power generation installed capacity within the calculated range from 18.9 MW to 57.6 MW. Like all other LFG collection and destruction initiatives (by flaring) and/or LFG utilization initiatives implemented in Brazil, such 3 initiatives were also implemented as CDM project activities as confirmed by the EPIC assessment team.

*Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number  $N_{all}$ .*

As correctly outlined in the revised PDD <sup>/2/</sup>, all initiatives identified in Step 2 are all registered / under registration, implemented and have operated as CDM project activities.

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<sup>18</sup> The following disclaimer is appropriately added in the revised PDD <sup>/2/</sup> regarding the implementation of the CDM project activity “Bandeirantes Landfill Gas to Energy Project (BLFGE)”:

*“The CDM project “Bandeirantes Landfill Gas to Energy Project (BLFGE)” started to utilize collected LFG as gaseous fuel for electricity generation in February 2004. The following is stated in the Monitoring Report for the 1<sup>st</sup> monitoring period of this particular CDM project activity (monitoring period from 23/03/2003 to 28/02/2006):*

*“(…) Some observations for the monitoring period:*

- no electricity was dispatched during the whole January/2004;*
- the electricity dispatched between 01/02/2004 and 31/03/2004 was excluded in this Monitoring Report because Eleropaulo hasn't monitored these data;*
- in the period May/2004, June/2004 and July/2004, the measurements of electricity dispatched were made manually by Sotreq.”*

Therefore, the EPIC assessment team confirms that, as correctly outlined in the revised PDD <sup>/2/</sup>, there is no single initiative in Brazil promoting LFG collection and LFG utilization (as fuel for electricity generation and/or as for any other purpose) that was implemented by not being proposed/registered as a CDM project activity. Thus,  $N_{all}$  is correctly defined as 0 (zero).

*Step 4: Within plants identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number  $N_{diff}$ .*

As also correctly highlighted in the revised PDD <sup>/2/</sup>, while all initiatives previously identified in Step 2 are indeed registered CDM project activities, thus there is no single initiative in Brazil promoting LFG collection and LFG utilization that was implemented by not being registered/proposed as a CDM project activity.

Thus, like  $N_{all}$ ,  $N_{diff}$  is also correctly directly defined as 0 (zero). This is correct.

*Step 5: calculate factor  $F = 1 - N_{diff} / N_{all}$  representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.*

As outlined in the revised PDD <sup>/2/</sup>, the factor  $F$  ( $F = 1 - N_{diff} / N_{all}$ ) is correctly calculated as follows:

*"While  $N_{all}$  and  $N_{diff}$  are both defined as 0 (zero), the calculated value for factor  $F$  (calculated as " $F = 1 - N_{diff} / N_{all}$ ") is thus directly assumed as "not determinable" (1 minus an undeterminable ratio (0 / 0)).*

*By taking into account the "non-determined" value for factor  $F$ , the following conditions of the methodological tool "Common practice" for having the project activity (under its revised design configuration) being regarded as a common practice within a sector in the applicable geographical area are therefore not simultaneously met:*

- Factor  $F > 0.2$
- $N_{all} - N_{diff} > 3.0$

*While as per applicable guidance of the methodological tool "Common practice", both conditions should be simultaneously fulfilled (in order to have the proposed project activity being regarded as a common practice within the sector in the applicable geographical area), since no value for Factor  $F$  and no value for the difference " $N_{all} - N_{diff}$ " are determinable the particular case of the project activity, the implementation of the project activity (under its revised design) is thus demonstrated not being common practice both at the time of the project's initial design conceptualization (within years 2004 and 2005) until nowadays (up to May/2018)."*

The EPIC assessment team confirms that the above-quoted statements included in the revised PDD <sup>/2/</sup> are deemed reasonable and correct. While both  $N_{all}$  and  $N_{diff}$  are determined as null (zero), the values for Factor  $F$  (calculated as " $F = 1 - N_{diff} / N_{all}$ ") is reasonably assumed as not determinable (1 minus an undeterminable ratio). The difference between  $N_{all}$  and  $N_{diff}$  is also reasonably assumed as not determinable.

By having the conditions of the methodological tool for eventually having the proposed project activity (under its revised design configuration) being regarded as common practice (within a sector in the applicable geographical area) not being simultaneously met ("*Factor  $F$  greater than 0.2*" and " *$N_{all} - N_{diff}$  greater than 3.0*"), the project activity (under its revised design configuration) is thus correctly regarded as not a common practice. This is in under complete conformance with the applicable guidance of the methodological tool "Common practice" (version 03.1) <sup>/24/</sup>.

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## Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
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