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Name of submitter	Vikash Talyan
Affiliated organization of submitter (if any)	Gold Standard foundation
Email of submitter	Vikash.talyan@goldstandard.org
Date of submission	25/09/2025

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Document reference number and title:
A6.4-MEP008-A04. Draft methodology: Flaring or use of landfill gas (version 01.0)

Item	Section no. (as indicated in the document)	Paragraph/Table/Figure no. (as indicated in the document)	Comment (including justification for change)	Proposed change (including proposed text)
1.1	Section 4	Paragraph 8(b)	**Upgrades to Existing Systems:** Paragraph 8(b) restricts applicability for upgrading existing systems only if the captured LFG was previously "flared and not used." This unnecessarily excludes projects aiming to improve existing, underperforming utilization systems (e.g., replacing old engines with new ones, or improving capture efficiency at a site already generating electricity).	Broaden the applicability to include upgrades/expansions of existing utilization systems, provided clear procedures establish the baseline performance. Refer to the detailed comment and proposed text for Revised Paragraph 8(b) below.
1.2	Section 4	Para 13(b)	**Leachate Recirculation**: Para 13(b) prohibits practices that increase methane generation, such as leachate recirculation, unless legally required. Leachate recirculation is often considered a best practice for modern landfill management that can improve the efficiency and overall volume of LFG capture.	Revise this condition to allow leachate recirculation if it is demonstrated that the practice aligns with sound environmental management and leads to higher overall lifetime methane capture and destruction. Refer to the detailed comment and proposed text for Revised Paragraph 13(b) below.

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2.1	Section 6	Section 6.2, Paras 24-26 and MEP Note	Lock-in Risk Analysis (Section 6.2): The draft methodology adequately addresses "Technology Lock-in" (flaring vs. utilization) (Para 26) and exempts Closed and New SWDSs (Paras 24-25). However, as noted by the MEP panel, it lacks a procedure for assessing "Practice Lock-in" for Existing, Open SWDSs. This is the risk that A6.4 revenues prolong the reliance on landfilling over superior waste management alternatives (e.g., recycling, composting) required by long-term climate strategies.	Incorporate explicit requirements for a project-level lock-in risk assessment for Existing, Open SWDSs. Proposed Revised Section 6.2 (Replacing Paras 24-26 and MEP Note) is below.
2.2	Section 6	Section 6.3.1 (Replacing Paras 27-46):	Investment Analysis (Section 6.3.1): Presenting two parallel options—one relying on a draft tool (Option 1) and another with draft methodology-specific procedures (Option 2)—is confusing and risks inconsistency. The methodology should integrate specific guidance as mandatory instructions to be applied using the standardized Investment Analysis tool.	The list of alternatives (Para 28/44) includes options like incineration (LFG6) or aerobic treatment (LFG5). These are generally not realistic investment alternatives for managing waste already destined for or deposited in an existing landfill. The analysis should differentiate required alternatives based on the SWDS status. Restructure the section to eliminate the dual tracks and clarify the appropriate alternative scenarios for existing vs. new SWDSs. Refer to details and the proposed revised text Section 6.3.1 (Replacing Paras 27-46) below.
3	Sections 7.2.2 and 8.1	Para 104 Para 106 Para 110 Para 158-160	The draft methodology employs "interim solutions" for key energy parameters (Grid Emission Factors, Captive Power EF, Baseline Heat Efficiency). These defaults are —excessively conservative for baseline emissions and excessively high for activity emissions—significantly impacting the accuracy and viability of LFG-to-Energy projects. The methodology relies on A6.4 tools that are not yet finalized.	As an interim measure until A6.4 tools are adopted, reference the established and widely used CDM methodological tools to provide robust, standardized procedures for determining these parameters. This could be considered as measure for ex-ante estimation only, while A6.4 TOOLS, when available must be applied for verification and issuance.
4.1	Section 7.3.2.1 Section 2	Table 10 Paras 129-130	The draft methodology introduces an ambitious mechanism to phase out credits for flaring over 5 years (Table 10). However, the phase-out applies to all flared gas. Utilization projects require backup flares for safety and operational necessity (e.g., engine downtime). If backup flaring is not credited, it may create a perverse incentive to reduce LFG collection efficiency when utilization equipment is offline.	Introduce definitions for "Primary" and "Backup" flaring. Apply the phase-out only to Primary Flaring, allowing Backup Flaring (capped at 15%) to be credited. Finalize the exemption procedure based on economic analysis. Refer to the detailed Proposed Additions to Section 2. Definitions: and Proposed Revised Paragraphs 127-130 (and associated equations) below.

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4.2	Section 7.3.2.2	7.3.2 – Downward adjustment in subsequent years (e.g., Equations 28, 29, 30)	The draft methodology applies an annual downward adjustment (e.g., 1%) to encourage ambition over time. The adjustment in year 'y' is calculated as a fixed, linear increase based on the *first year's* baseline emissions (BE_y1). Adjustment_y = DA_initial + (BE_y1 * 0.01 * (y-y1)) This mechanism is scientifically inappropriate for landfill gas projects. LFG generation follows a First Order Decay (FOD) model; emissions decline exponentially over time. Consequently, the *ex-post* monitored baseline emissions (BE_y) also decline over time.	The downward adjustment mechanism must be revised so that the annual ambition increase is calculated relative to the current year's baseline emissions (BEy), rather than the first year's emissions (BEy1). The downward adjustment mechanism must be revised so that the annual ambition increase is calculated relative to the current year's baseline emissions (BE_y), rather than the first year's emissions (BE_y1). Revise the core equations in Section 7.3.2.1. Example Revision for Equation 28 (Electricity): FCH4,EL,adj,y = FCH4,EL,y - [DACH4,EL + (FCH4,EL,y × 0.01 × (y-y1))] (Equation 28 Revised) [Note: This changes the basis of the adjustment from FCH4,EL,y1 to FCH4,EL,y. Similar changes should be applied to Equations 29 and 30.]
5.1	Section 9	Para 178	A flat 0.5% discount is applied for upstream leakage (embodied emissions in equipment) (Para 178). This simplification may not adequately account for the higher embodied emissions in complex utilization infrastructure (e.g., engines, RNG plants) compared to simple flares.	Introduce differentiated Leakage Discount Factors (LDF) based on the complexity of the project configuration to improve the accuracy of leakage accounting.

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5.2	Appendix 2		The draft methodology assesses leakage from upstream embodied emissions to derive the Leakage Discount Factor (LDF). However, the analysis in Appendix 2 explicitly limits the scope of this Life Cycle Assessment (LCA) only to the HDPE pipelines used for LFG collection. This scope is incomplete as it omits major sources of embodied emissions, including flare stacks, blower systems, engines, generators, gas upgrading equipment (RNG plants), and civil works. By limiting the scope, the methodology significantly underestimates upstream leakage, leading to an unrealistically low and non-conservative leakage factor (0.5%).	The scope of the LCA must be expanded to include all significant equipment and infrastructure. Differentiated LDFs should be applied based on the complexity of the technology.
6	Section 7	7.2.2.1.5 (Para 96(d)) – Determination of F_CH4,BL,y for Case 2, Scenario D. Equation 9	This scenario addresses situations where regulations mandate a *passive* LFG capture system and flaring (e.g., for safety). The methodology mandates a default baseline destruction rate equal to **40%** of the LFG captured by the *project activity* ($F_{LFG,AC,capt,y}$). This approach should consider two critical aspects: a. unrealistic assumptions and avoid penalizing ambitions. Please refer to the text below for further details.	The methodology must decouple the baseline performance from the project activity. The baseline destruction should be calculated based on the estimated total LFG generation multiplied by conservative, fixed efficiencies for passive capture and flaring. Please refer to the text below for further details.

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7	Section 7	7.2.1.1.4 (Para 57(a)) – Identification of economically viable technologies (for New SWDSs).	Paragraph 57(a) states that a technology is deemed economically viable if "They have been implemented by **at least one facility** within the applicable baseline geographical reference area..." This "single instance" criterion is insufficient to establish general economic viability. A single facility may be an outlier or benefit from unique circumstances not applicable to the proposed A6.4 activity. This low threshold risks setting unrealistic baselines, contrasting sharply with the rigor applied to the project's additionality demonstration.	Strengthen the criteria for determining economic viability in the BAT analysis to require evidence of broader adoption under prevailing market conditions. Please refer to the text below for further details.
8	Section 7	Section 7.2.2.1.2	The Methane Oxidation Factor (OXy) represents the fraction of methane oxidized in the landfill cover soil. The scientific understanding of OXy has evolved significantly, recognizing that it is highly dependent on climate, cover material type, and management practices. The approach presented in the draft methodology (Section 7.2.2.1.2) presents several critical limitations. Please refer to the text below for further details	It is recommended to replace the existing Section 7.2.2.1.2 (Paragraphs 88-92, including Tables 7 and 8) with a streamlined, tiered approach that incorporates the IPCC 2019 defaults and retains the option for site-specific measurement (using the central estimates from the referenced study as currently drafted).

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Proposed Revisions to A6.4-MEP008-A04

1. Applicability Conditions (Section 4)

1.1. Upgrades to Existing Systems

- **Context/Issue Identified:** Paragraph 8(b) restricts applicability for upgrading existing systems only if the captured LFG was previously "flared and not used." This unnecessarily excludes projects aiming to improve existing, underperforming utilization systems (e.g., replacing old engines with new ones, or improving capture efficiency at a site already generating electricity).
- **Proposed Revision:** Broaden the applicability to include upgrades/expansions of existing utilization systems, provided clear procedures establish the baseline performance.

Proposed Revised Paragraph 8(b):

(b) Investing into an existing (active or passive) LFG capture system to increase the recovery rate **or utilization efficiency,** where the captured LFG prior to the implementation of the Article 6.4 activity was flared **or utilized,** and:

(i) The amount of LFG captured and/or the energy generated by the existing system is monitored separately from the system implemented or upgraded as part of the Article 6.4 activity; or

(ii) The efficiency of the existing system is not impacted by the system implemented as part of the Article 6.4 activity, and historical data on the amount of LFG captured and flared **or utilized** is available to establish the baseline performance (if such historical data is not available, no A6.4 ERs can be claimed for the pre-existing capacity);

1.2. Leachate Recirculation

- **Context/Issue Identified:** Para 13(b) prohibits practices that increase methane generation, such as leachate recirculation, unless legally required. Leachate recirculation is often considered a best practice for modern landfill management that can improve the efficiency and overall volume of LFG capture.
- **Proposed Revision:** Revise this condition to allow leachate recirculation if it is demonstrated that the practice aligns with sound environmental management and leads to higher overall lifetime methane capture and destruction.

Proposed Revised Paragraph 13(b):

(b) If the management of the SWDS in the Article 6.4 activity scenario is changed in a manner that increases methane generation (for example by recirculating the leachate) compared to the situation prior to the implementation of the project activity, unless:

(i) The change is implemented due to legal requirements; or

(ii) It is demonstrated and validated that the change represents environmentally sound landfill management practice and leads to a higher overall LFG capture efficiency over the lifetime of the SWDS.

2. Demonstration of Additionality (Section 6)

2.1. Lock-in Risk Analysis (Section 6.2)

- **Context/Issue Identified:** The methodology adequately addresses "Technology Lock-in" (flaring vs. utilization) (Para 26) and exempts Closed and New SWDSs (Paras 24-25). However, as noted by the MEP panel, it lacks a procedure for assessing "Practice Lock-in" for **Existing, Open SWDSs**. This is the risk that A6.4 revenues prolong the reliance on landfilling over superior waste management alternatives (e.g., recycling, composting) required by long-term climate strategies.
- **Proposed Revision:** Incorporate explicit requirements for a project-level lock-in risk assessment for **Existing, Open SWDSs**.

Proposed Revised Section 6.2 (Replacing Paras 24-26 and MEP Note):

6.2. Avoidance of locking-in the level of emissions

24. The analysis of lock-in risk assesses the risk of
    (a) Technology Lock-in (locking in flaring vs. utilization) and
    (b) Practice Lock-in (locking in landfilling vs. superior waste management alternatives).
25. **Technology Lock-in (Flaring vs. Utilization):** The risk of locking in LFG flaring is mitigated at the methodology level through the requirements for Investment Analysis (Section 6.3.1), which prioritize utilization if financially viable, and the application of the Adjustment Factor (AF_flare,y) (Section 7.3.2.1), which phases out crediting for Primary Flaring over 5 years.
26. **Practice Lock-in (Landfilling):** The risk assessment conclusions for Practice Lock-in depend on the status of the SWDS:
    (a) **Closed SWDSs:** Activities at closed SWDSs are deemed to have no practice lock-in risk, as no further waste is deposited. No further project-level assessment is required.
    (b) **New (Greenfield) SWDSs:** Activities at new SWDSs are deemed to have mitigated the practice lock-in risk, as the methodology requires the baseline to be the Best Available Technology (BAT) (Section 7.2.1.1). Activity participants shall transparently document the BAT analysis in the PDD for validation.
    (c) **Existing, Open SWDSs:** For activities implemented at existing, open SWDSs, activity participants shall conduct a project-level analysis of the risk that the A6.4 revenues may prolong the reliance on landfilling practices. The PDD shall include:
        (i) **Analysis of Waste Management Strategies:** An assessment of the host country's national or sub-national strategies, NDCs, and LT-LEDS (if available) regarding the long-term transition of the waste sector, including targets for waste diversion, recycling, and composting in the relevant geographical area.
        (ii) **Assessment of Barriers and Incentives:** A justified demonstration that the implementation of the Article 6.4 activity and the associated revenues do not create or exacerbate barriers to the implementation of alternative, lower-emission waste management practices necessary to achieve the strategies identified in (i).
        (iii) **Consistency Check:** Confirmation that the continued operation of the existing SWDS, supported by the A6.4 activity, is consistent with the required transition pathways, considering the specific socio-economic context and infrastructure.
        The analysis shall be conducted conservatively, based on credible evidence, validated by the DOE, and reviewed at the renewal of the crediting period.

2.2. Investment Analysis (Section 6.3.1)

- **Context/Issue Identified (Structure):** Presenting two parallel options—one relying on a draft tool (Option 1) and another with methodology-specific procedures (Option 2)—is confusing and risks inconsistency. The methodology should integrate specific guidance as mandatory instructions to be applied *using* the standardized Investment Analysis tool.
- **Context/Issue Identified (Alternative Scenarios):** The list of alternatives (Para 28/44) includes options like incineration (LFG6) or aerobic treatment (LFG5). These are generally not realistic investment alternatives for managing waste already destined for or deposited in an *existing* landfill. The analysis should differentiate required alternatives based on the SWDS status.
- **Proposed Revision:** Restructure the section to eliminate the dual tracks and clarify the appropriate alternative scenarios for existing vs. new SWDSs.

Proposed Revised Section 6.3.1 (Replacing Paras 27-46):

6.3.1. Investment analysis

27. Investment analysis shall be conducted by activity participants following the provisions of the "Methodological tool: Investment analysis" (hereinafter referred to as the investment analysis tool).
28. In applying the tool, activity participants shall adhere to the following methodology-specific requirements:
    (a) **Identification of alternative scenarios:** Activity participants shall identify realistic and credible alternative scenarios.

(i) **For Existing SWDSs (Closed or Open):** The analysis shall focus on alternatives for managing the LFG generated by the SWDS. Alternatives involving different fundamental waste treatment methods (e.g., incineration of incoming waste) are not considered realistic alternatives for an existing SWDS. Scenarios shall include, but not be limited to:

- LFG-A1: The Article 6.4 activity implemented without registration under the Article 6.4 mechanism.
- LFG-A2: Atmospheric release of the LFG (if legally permissible).
- LFG-A3: Capture and destruction of LFG through flaring only, to the extent required to comply with regulations, contractual requirements, or address safety/odour concerns.
- LFG-A4: Alternative levels or technologies for LFG utilization.

(ii) **For New (Greenfield) SWDSs:** The analysis shall consider the alternative waste treatment scenarios identified during the BAT process (Section 7.2.1.1.2), such as composting, incineration, and SWDS with various LFG management options.

(b) **Type of Analysis:** Use the investment comparison analysis. If the only realistic alternative is the continuation of the current situation, the benchmark analysis may be used. Simple cost analysis may only be used if it is demonstrated that the activity (e.g., flaring only) and all alternatives generate no revenues or cost savings other than A6.4ERs.

(c) **Financial Indicator:** Use the net present value (NPV) for investment comparison analysis. Use an appropriate indicator such as internal rate of return (IRR) or NPV for benchmark analysis.

(d) **Entity Context:** Assume that the Article 6.4 activity could be implemented by either the activity participants or other entities, unless demonstrated otherwise.

29. **Sensitivity Analysis:** In conducting the sensitivity analysis required by the investment analysis tool, apply a variation of at least ± 10% to the input values which constitute more than 20% of the total costs or total revenues.

3. Energy Parameters (Sections 7.2.2 and 8.1)

- **Context/Issue Identified:** The methodology employs "interim solutions" for key energy parameters (Grid Emission Factors, Captive Power EF, Baseline Heat Efficiency). These defaults are highly problematic—excessively conservative for baseline emissions and excessively high for activity emissions—significantly impacting the accuracy and viability of LFG-to-Energy projects. The methodology relies on A6.4 tools that are not yet finalized.
- **Proposed Revision:** As an interim measure until A6.4 tools are adopted, reference the established and widely used CDM methodological tools to provide robust, standardized procedures for determining these parameters. This could be considered as measure for ex-ante estimation only, while A6.4 TOOLS, when available must be applied for verification and issuance.

The integrity and effectiveness of the Article 6.4 mechanism depend fundamentally on the accurate quantification of emission reductions, which must be grounded in scientifically sound logic and empirical data. A critical review of the "interim defaults" for energy parameters within the draft methodology A6.4-MEP008-A04 reflects significant flaws that jeopardize this foundation. While the principle of conservativeness is essential for managing uncertainty, it must not be misapplied to impose assumptions that starkly contradict physical reality or create internal methodological inconsistencies. Conservativeness is intended to prevent the overestimation of emission reductions; it must not be misused to impose arbitrary defaults that lack scientific justification and unfairly penalize legitimate mitigation activities. The current defaults are so restrictive that they unduly penalize LFG-to-Energy projects, systematically undervalue their mitigation impact, and threaten the viability of this important climate solution.

This quantitative assessment demonstrates that these defaults are unrealistic when compared to established international data, standardized baselines, and, crucially, the methodology's own internal calculations for leakage and activity emissions.

i. Baseline Grid Emission Factor (EF_grid,y)

This factor determines the emissions avoided when the LFG project displaces grid electricity.

- **Draft Methodology Default (Para 104a):** 0.2 tCO_2/MWh (for grids where the proportion of renewable/nuclear energy is ≤ 33%).
- **Context:** This category represents grids relying primarily on fossil fuels, common in many developing countries.
- **Quantitative Comparison:**
    - **Global Average:** The global average grid emission factor in 2023 was approximately 0.486 tCO_2/MWh (IEA data).
    - **CDM Standardized Baselines (ASBs):** The median of over 160 approved CDM ASBs is approximately 0.73 tCO_2/MWh. Examples for countries with low renewable penetration include South Africa (0.959) and Indonesia (Java-Bali) (0.821).
- **Conclusion:** The proposed default of 0.2 tCO_2/MWh is drastically lower than observed data (e.g., 72.6% lower than the median ASB), substantially undervaluing the climate benefit of displacing grid electricity.

ii. Activity Grid Consumption Emission Factor (EF_EC,grid,y)

This factor determines the emissions caused by the project consuming electricity from the grid.

- **Draft Methodology Default (Para 158a):** 1.3 tCO_2/MWh (for grids where the proportion of renewable/nuclear energy is ≤ 33%).
- **Context:** This default is applied to the *same grid* as the baseline emission factor above.
- **Quantitative Comparison:** The value of 1.3 tCO_2/MWh is exceptionally high, exceeding nearly all national grid intensities globally. It is more representative of highly inefficient, isolated diesel generation than a national grid supply.
- **Conclusion:** The default of 1.3 tCO_2/MWh is unrealistic for grid consumption and excessively penalizes project activity emissions.

iii. The Impact of Asymmetry and Internal Contradictions

The critical issue is the simultaneous application of an artificially low baseline EF and an artificially high activity EF for the same grid. This creates a fundamental internal contradiction.

A. The Asymmetry:

It is methodologically unsound and physically unrealistic to assume that electricity consumed from a grid has an emission intensity **6.5 times higher** (1.3 vs 0.2 tCO_2/MWh) than electricity supplied to the same grid.

Illustrative Example: Consider an LFG-to-Energy project generating 100 MWh and consuming 15 MWh internally (parasitic load).

- **Using Draft Defaults:**
    - Baseline Emissions (Credit): 100 MWh * 0.2 tCO_2/MWh = 20.0 tCO_2
    - Activity Emissions (Debit): 15 MWh * 1.3 tCO_2/MWh = 19.5 tCO_2
    - Net Emission Reduction: **0.5 tCO_2**
- **Using Realistic Grid EF (e.g., Median ASB 0.73 tCO_2/MWh):**
    - Net Emission Reduction: **62.05 tCO_2**

In this realistic scenario, the proposed defaults reduce the project's creditable emission reductions by over 99%.

B. Contradiction with Appendix 2 (Leakage Assessment):

Appendix 2 details the Life Cycle Assessment (LCA) used to determine leakage. This LCA requires an emission factor for electricity consumed during manufacturing.

- **The Evidence in Appendix 2, Paragraph 8:**

"The electricity emission factor used was **0.4788 tCO_2/MWh** (based on the global average electricity emission factor from 2021, IEA)."

- **The Inconsistency:** The methodology utilized a realistic, data-driven global average emission factor (0.4788 tCO_2/MWh) when performing background assessments for leakage, yet mandate the contradictory defaults (0.2 and 1.3 tCO_2/MWh) in the main body of the methodology. The methodology relies on established scientific data (IEA) in its leakage assessment while imposing arbitrary, contradictory figures in the primary emission calculations.

iv. **Baseline Captive Power Emission Factor (EF_captive,y)**

This applies when LFG electricity replaces an existing captive fossil fuel power plant.

- **Draft Methodology Default (Para 106):** 0.3 tCO_2/MWh.
- **Quantitative Comparison:**
  - 0.3 tCO_2/MWh implies an efficiency level (60-70%) achievable only by the most advanced combined-cycle gas turbines (CCGT), which are rarely the baseline technology for captive applications.
  - **Typical Technologies:**
    - Diesel Generator (Large, Efficient): ~0.70 - 0.80 tCO_2/MWh
  - **CDM TOOL09 Defaults:** A >1MW diesel generator less than 5 years old has a default EF of approximately 0.62 tCO_2/MWh.
- **Conclusion:** The default of 0.3 tCO_2/MWh significantly underestimates baseline emissions (by over 50% compared to TOOL09 defaults).

v. **Baseline Heat Generation Efficiency (η_HG,BL,j)**

This applies when LFG utilization replaces heat generated in existing equipment (e.g., boilers).

- **Draft Methodology Default (Para 110):** 90% (or manufacturer specification if higher).
- **Quantitative Comparison:**
  - **Industry Data:** Coal boilers often operate at 75-85%; older oil boilers may be 80-85%.
  - **Impact:** If a project replaces a 75% efficient boiler, mandating a 90% baseline efficiency artificially reduces the calculated emission reductions by 16.7%.
- **Conclusion:** Mandating 90% as a floor for all technologies and ages is overly stringent and does not reflect a conservative assessment of actual baseline technology.

Summary Recommendation

The quantitative assessment and the analysis of internal inconsistencies confirm that the interim energy defaults in A6.4-MEP008-A04 are severely misaligned with established data, scientific consensus, and the methodology's own background analysis. These defaults are punitive rather than conservative. The analysis strongly justifies the recommendation to replace these arbitrary defaults by referencing the established CDM Methodological Tools (TOOL05, TOOL07, and TOOL09) as an interim measure.

Proposed Revised Paragraph 104 (Baseline Grid EF):

104. **Until the adoption of an applicable A6.4 methodological tool for determining grid emission factors, activity participants shall determine EF_grid,y by applying the latest version of the CDM "TOOL07: Tool to calculate the emission factor for an electricity system."**

Revised Paragraph 106 (Baseline Captive EF):

106. **Until the adoption of an applicable A6.4 methodological tool, activity participants shall determine EF_captive,y by applying the relevant procedures for existing captive power plants in the latest version of the CDM "TOOL09: Determining the baseline efficiency of thermal or electric energy generation systems," utilizing historical data, measurements, or conservative defaults as specified in the tool.**

Revised Paragraph 110 (Baseline Heat Efficiency):

110. **Until the adoption of an applicable A6.4 methodological tool, activity participants shall determine the baseline energy efficiency (η_HG,BL,j) by applying the latest version of the CDM "TOOL09: Determining the baseline efficiency of thermal or electric energy generation systems." The determination shall be based on historical data, measurements, manufacturer specifications, or technology/fuel-specific defaults as specified in the tool, ensuring the most conservative (highest efficiency) approach is used.**

Revised Paragraphs 158-160 (Activity Emissions from Electricity):

158. **Until the adoption of an applicable A6.4 methodological tool, activity participants shall determine EF_EC,grid,y by applying the latest version of the CDM "TOOL05: Baseline, project and/or leakage emissions from electricity consumption."**
159. **Until the adoption of an applicable A6.4 methodological tool, activity participants shall determine EF_EC,captive,y by applying the latest version of the CDM "TOOL05: Baseline, project and/or leakage emissions from electricity consumption."**
160. **The parameters F_TDL,grid and F_TDL,captive shall be determined according to the procedures in the latest version of the CDM "TOOL05."**

4. Downward Adjustment and Flaring Phase-Out (Section 7.3.2.1)

4.1 Flaring phase-out Small-Scale Exemptions

- **Context/Issue Identified (Backup Flares):** The methodology introduces an ambitious mechanism to phase out credits for flaring over 5 years (Table 10). However, the phase-out applies to all flared gas. Utilization projects require backup flares for safety and operational necessity (e.g., engine downtime). If backup flaring is not credited, it may create a perverse incentive to reduce LFG collection efficiency when utilization equipment is offline.
- **Context/Issue Identified (Small-Scale Exemptions):** The exemptions for small sites where utilization is unviable (Paras 129-130) are presented as options with undefined thresholds (e.g., [1 MW], [3 MW]). A procedure based on economic viability (Option 2) is preferred over arbitrary thresholds (Option 1).
- **Proposed Revision:** Introduce definitions for "Primary" and "Backup" flaring. Apply the phase-out only to Primary Flaring, allowing Backup Flaring (capped at 15%) to be credited. Finalize the exemption procedure based on economic analysis.

Proposed Additions to Section 2. Definitions:

(s) Backup Flaring: The destruction of LFG in a flare that occurs when the associated utilization equipment (e.g., engine, boiler, upgrading facility) is non-operational due to maintenance or failure, or when the volume of LFG captured exceeds the capacity of the utilization equipment. Backup flaring only occurs in activities that include a utilization component.

(t) Primary Flaring: The destruction of LFG in a flare when the Article 6.4 activity does not include any utilization component, or flaring that exceeds the allowable threshold for Backup Flaring in a utilization activity.

Proposed Revised Paragraphs 127-130 (and associated equations):

127. The following downward adjustments shall be applied depending on whether the LFG is destroyed in flares and/or used under the Article 6.4 activity.

(a) If the LFG is destroyed in flares, the amount of methane flared ($F_{CH4,flared,y}$) shall be categorized into Backup Flaring ($F_{CH4,BackupFlare,y}$) and Primary Flaring ($F_{CH4,PrimaryFlare,y}$).

(i) $F_{CH4,BackupFlare,y}$ is the amount of methane flared during documented periods of non-operation of the utilization equipment or when supply exceeds utilization capacity. **$F_{CH4,BackupFlare,y}$ shall be capped at X [15%] of the total methane captured ($F_{CH4,AC,y}$) in year y.**

(ii) $F_{CH4,PrimaryFlare,y}$ is the remaining amount of methane flared: $F_{CH4,PrimaryFlare,y} = F_{CH4,flared,y} - F_{CH4,BackupFlare,y}$

(b) The downward adjustment for flared methane ($F_{CH4,flared,adj,y}$) is the sum of the adjusted Primary and Backup flaring amounts.

(i) **Adjustment for Primary Flaring:** Apply the maximum between the 1% annual increase and the Adjustment Factor ($AF_{flare,y}$):

$F_{CH4,PrimaryFlare,adj,y} = F_{CH4,PrimaryFlare,y}$ - [$DA_{CH4,PrimaryFlare}$ + max { ($F_{CH4,PrimaryFlare}$,y1 * 0.01 * (y-y1)) ; **($F_{CH4,PrimaryFlare,y}$ * (1 - $AF_{flare,y}$))** }] *(Equation 26 Revised)*

(ii) **Adjustment for Backup Flaring:** Apply only the 1% annual increase:

$F_{CH4,BackupFlare,adj,y} = F_{CH4,BackupFlare,y}$ - [$DA_{CH4,BackupFlare}$ + ($F_{CH4,BackupFlare,y1}$ * 0.01 * (y-y1))] *(Equation 26a New)*

128. The Adjustment Factor (AF_flare,y) provided in Table 10 is applied only to Primary Flaring to discourage activities without energy recovery and to prevent locking-in this technology.
[Table 10 remains the same]

[Replacing Paras 129-130 (Options 1-3)]

129. **Exemption from the Adjustment Factor (AF_flare,y):** The Adjustment Factor (AF_flare,y) in Equation 26 does not need to be applied (i.e., $AF_{flare,y}$ = 100% for all years), if the activity participant demonstrates and validates that LFG utilization (energy generation or supply of LFG/biomethane) is not economically attractive at the project site.

(a) This demonstration shall be conducted using the "Methodological tool: Investment analysis," comparing the Primary Flaring activity against technically feasible utilization alternatives.

(b) The analysis must demonstrate that the utilization alternatives are not financially viable, even when including potential revenues from A6.4 ERs.

(c) This assessment shall be documented in the PDD and reassessed at each renewal of the crediting period.

131. [Requires consequential updates to define $DA_{CH4,PrimaryFlare}$ and $DA_{CH4,BackupFlare}$ based on Equation 27 logic].

4.2 Mathematical Logic of the Downward Adjustment Over Time

- **Context/issue identified:** The methodology applies an annual downward adjustment (e.g., 1%) to encourage ambition over time. The adjustment in year 'y' is calculated as a fixed, linear increase based on the first year's baseline emissions (BEy1).
  $Adjustment_y = DA_{initial} + (BE_{y1} * 0.01 * (y-y1))$

  This mechanism is scientifically inappropriate for landfill gas projects. LFG generation follows a First Order Decay (FOD) model; emissions decline exponentially over time. Consequently, the ex-post monitored baseline emissions (BE_y) also decline over time.
  Applying a fixed linear adjustment (anchored to the peak emissions of Year 1) to an exponentially declining baseline results in a disproportionately large penalty in later years. If the baseline declines by 50% by Year 10, the cumulative 10% fixed adjustment (based on Year 1) actually represents a 20% penalty relative to the Year 10 baseline.

- **Proposed Revision:**
  The downward adjustment mechanism must be revised so that the annual ambition increase is calculated relative to the current year's baseline emissions (BE_y), rather than the first year's emissions (BE_y1).

Revises core equations in Section 7.3.2.1.

Example Revision for Equation 28 (Electricity):
$F_{CH4,EL,adj,y} = F_{CH4,EL,y} - [DA_{CH4,EL} + (\mathbf{F_{CH4,EL,y}} \times 0.01 \times (y-y1))]$ *(Equation 28 Revised)*
[Note: This changes the basis of the adjustment from $F_{CH4,EL,y1}$ to $F_{CH4,EL,y}$. Similar changes must be applied to Equations 29 and 30.]

5. Leakage (Section 9)

5.1 Leakage accounting

- **Context/Issue Identified:** A flat 0.5% discount is applied for upstream leakage (embodied emissions in equipment) (Para 178). This simplification may not adequately account for the higher embodied emissions in complex utilization infrastructure (e.g., engines, RNG plants) compared to simple flares.

- **Proposed Revision:** Introduce differentiated Leakage Discount Factors (LDF) based on the complexity of the project configuration to improve the accuracy of leakage accounting.

Revised Paragraph 178 and Equation 50:

178. Adjusted yearly baseline emissions shall be discounted by **a Leakage Discount Factor (LDF)** to account for leakage emissions **(upstream emissions from the manufacturing of the equipment used in the activity scenario)**, as follows:

LE_y = **LDF** × BE_adj,y *(Equation 50 Revised)*

Where: LE_y = Leakage emissions in year y (tCO2e/year) **LDF = Leakage Discount Factor (fraction)** BEadj,y = Downward adjusted baseline emissions in year y (tCO2e/year)

The following values for LDF shall be applied based on the project configuration:

(a) LFG Capture and Flaring only: **LDF = 0.005 (0.5%)**

(b) LFG Utilization for Electricity Generation or Direct Heat (Engines/Boilers/Kilns): **LDF = 0.015 (1.5%)**

(c) LFG Utilization for Biomethane/RNG production and supply (Upgrading Facilities): **LDF = 0.025 (2.5%)**

If the activity involves multiple configurations, the highest applicable LDF shall be applied to the total baseline emissions.

5.2 Incomplete Scope of Leakage LCA

Relevant Section: Appendix 2 – Identification and Avoidance or Minimization of Leakage.

Detailed Description of the issue: The methodology assesses leakage from upstream embodied emissions to derive the Leakage Discount Factor (LDF). However, the analysis in Appendix 2 explicitly limits the scope of this Life Cycle Assessment (LCA) only to the HDPE pipelines used for LFG collection.

This scope is incomplete as it omits major sources of embodied emissions, including flare stacks, blower systems, engines, generators, gas upgrading equipment (RNG plants), and major civil works. By limiting the scope, the methodology significantly underestimates upstream leakage, leading to an unrealistically low and non-conservative leakage factor (0.5%).

Recommendation for Revision: The scope of the LCA must be expanded to include all significant equipment and infrastructure. Differentiated LDFs should be applied based on the complexity of the technology.

Proposed Fix:

1. Revise Appendix 2 to mandate the inclusion of all major equipment (collection system, processing equipment, destruction/utilization hardware, and civil works) in the LCA scope.
2. Revise Paragraph 178 and Equation 50 to apply differentiated Leakage Discount Factors:

Revised Para 178 (excerpt): The following values for LDF shall be applied based on the project configuration:

(a) LFG Capture and Flaring only: **LDF = 0.005 (0.5%)**

(b) LFG Utilization for Electricity Generation or Direct Heat: **LDF = 0.015 (1.5%)**

(c) LFG Utilization for Biomethane/RNG production and supply: **LDF = 0.025 (2.5%)**

6. Unrealistic Default and Logical error for Baseline Passive LFG Systems

Relevant Section: 7.2.2.1.5 (Para 96(d)) – Determination of F_CH4,BL,y for Case 2, Scenario D.

Detailed Description of the issue: This scenario addresses situations where regulations mandate a *passive* LFG capture system and flaring (e.g., for safety). The methodology mandates a default baseline destruction rate equal to **40%** of the LFG captured by the *project activity* ($F_{LFG,AC,capt,y}$). This approach should consider two critical aspects:

1. **Unrealistic Assumptions:** The 40% default is derived (Footnote 13) using assumptions that are skewed to minimize project credits: Baseline (Passive) Capture Efficiency = 20% (optimistic); Project (Active) Capture Efficiency = 50% (pessimistic; modern systems achieve 75-90%); and Baseline Flare Efficiency = 100% (non-conservative, as it maximizes baseline destruction). Using more realistic assumptions (e.g., Passive=15%, Active=80%, Flare=90%) yields a ratio of approximately 17%, not 40%.
2. **Fundamental Logical Error (Penalizing Ambition):** The critical flaw is linking the baseline performance (40% ratio) to the actual amount captured by the project. Baseline conditions must be established independently of project performance. The current structure penalizes superior systems: a project capturing 90% of the LFG incurs a larger absolute deduction (40% of 90% = 36% of total LFG) than a project capturing 50% (40% of 50% = 20% of total LFG). This creates a perverse incentive against maximizing mitigation.

Recommendation for Revision: The methodology must decouple the baseline performance from the project activity. The baseline destruction should be calculated based on the estimated total LFG generation multiplied by conservative, fixed efficiencies for passive capture and flaring.

Proposed revision: Revise Paragraph 96(d) and Equation 9:
(d) Scenario D: if the requirement does not specify the amount or the percentage of the captured LFG that must be flared but requires the installation of a passive LFG capture system for safety reasons and flaring the LFG, then the baseline destruction is calculated based on the estimated LFG generation and conservative default efficiencies for passive systems:
$F_{CH4,BL\text{-}case\ 2,y} = \boldsymbol{\eta_{Passive,BL} \times \eta_{Flare,BL} \times F_{CH4,Gen,y}}$ *(Equation 9 Revised)*
Where: η_Passive,BL = Conservative default efficiency for passive LFG capture systems = **0.15 (15%)** $\eta_{Flare,BL}$ = Conservative default efficiency for baseline flaring = **0.90 (90%)** [Assuming enclosed flares; if open flares are contextually appropriate for the baseline, a lower default, e.g., 50%, should be used] $F_{CH4,Gen,y}$ = Estimated amount of methane generated by the SWDS in year y (tCH4/year), calculated using the "Methodological tool: Emissions from solid waste disposal sites."

7. Simplistic Criteria for Economic Viability in BAT Analysis

Relevant Section: 7.2.1.1.4 (Para 57(a)) – Identification of economically viable technologies (for New SWDSs).
Detailed Description of the issue: Paragraph 57(a) states that a technology is deemed economically viable if "They have been implemented by **at least one facility** within the applicable baseline geographical reference area..."
This "single instance" criterion is insufficient to establish general economic viability. A single facility may be an outlier or benefit from unique circumstances not applicable to the proposed A6.4 activity. This low threshold risks setting unrealistic baselines, contrasting sharply with the rigor applied to the project's additionality demonstration.
Recommendation for Revision: Strengthen the criteria for determining economic viability in the BAT analysis to require evidence of broader adoption under prevailing market conditions.
Proposed revision: Revise Paragraph 57(a):
(a) They have been implemented **under prevailing market conditions without significant, non-replicable subsidies** by **multiple facilities (e.g., representing at least 5% of the market share for that service or at least three independent operations)** within the applicable baseline geographical reference area without the revenues from carbon credits; or

8. Methane Oxidation Factor (OXy) (Section 7.2.2.1.2)

Context/Issue Identified
The Methane Oxidation Factor (OXy) represents the fraction of methane oxidized in the landfill cover soil. The scientific understanding of OXy has evolved significantly, recognizing that it is highly dependent on climate, cover material type, and management practices.
The approach presented in the draft methodology (Section 7.2.2.1.2) presents several critical limitations:

1. **Outdated Scientific Basis:** The methodology's default values (Option 3) are based on older guidelines and fail to incorporate the updated, nuanced framework provided by the **2019 Refinement to the 2006 IPCC Guidelines**. The 2019 Refinement is the current international consensus and provides differentiated defaults based on key drivers of oxidation.
2. **Lack of Representativeness:** The current approach does not adequately differentiate between key landfill conditions that significantly affect oxidation rates:
   - **Climate:** Oxidation rates are significantly lower in arid, boreal, or polar climates compared to temperate or tropical climates.
   - **Cover Type:** Intermediate covers (on active landfills) exhibit lower and more variable oxidation than stable, well-managed final covers (on closed landfills).
3. **Ambiguity on Non-Oxidizing Conditions:** The methodology lacks explicit guidance for situations where the baseline cover material is non-oxidizing (e.g., synthetic geomembranes) or absent, where OXy should scientifically be zero.
4. **Confusing and Restrictive Structure:** The current structure of three options (Paras 88-89) and the restrictive applicability criteria (Table 7) are confusing and unnecessarily complex. The methodology should clearly offer the standardized IPCC 2019 approach as an alternative (Tier 1/2) to the site-specific measurement approach (Tier 3).

To ensure the methodology is scientifically robust and representative, the approach for determining OXy must be updated to align with the IPCC 2019 Refinement and provide clear, flexible optionality.

Proposed Revision

It is recommended to replace the existing Section 7.2.2.1.2 (Paragraphs 88-92, including Tables 7 and 8) with a streamlined, tiered approach that incorporates the IPCC 2019 defaults and retains the option for site-specific measurement (using the central estimates from the referenced study as currently drafted).

Revised Section 7.2.2.1.2. Determination of OXy:

7.2.2.1.2. Determination of OXy

88. Activity participants shall determine the fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline scenario (OXy) using one of the two options below. This approach applies to both existing and new SWDSs. The selected option shall be documented in the PDD.

Option A: Apply IPCC Standardized Defaults (Tier 1/2).

89. The value for OXy shall be determined based on the climate zone and the type of cover material, according to the defaults provided in the 2019 Refinement to the 2006 IPCC Guidelines (Volume 5, Chapter 3).

Table 7. IPCC Default Values for OXy based on Climate and Cover Type

Cover Type	Conditions	Climate Zone	OXy
Final Covers (Closed SWDSs or closed cells)	Well-managed soil covers designed to optimize aeration.	Temperate and Tropical	0.35 (35%)
Final Covers (Closed SWDSs or closed cells)	All conditions.	Boreal, Polar, Arid/Semi-Arid	0.10 (10%)
Intermediate or Daily Covers (Open, Active SWDSs)	Soil-based covers.	All Climates	0.10 (10%)
Non-Oxidizing Covers	Geomembrane only, non-porous material, or No Cover.	All Climates	0.00 (0%)

90. For SWDSs with heterogeneous cover types (e.g., different cells with final and intermediate covers), a weighted average OXy shall be calculated using Equation 5 below.

Option B: Site-Specific Measurement (Tier 3).

91. Activity participants may determine OXy based on the measurement of the average flux of methane leaving the surface (J_out) using the flux box method as per the procedure contained in Appendix 1.

(a) The activity participants shall divide the SWDS into different zones. For each zone i, a value of the oxidation factor (OX_i) based on the measured flux (J_out) shall be selected as per the table below, utilizing the central estimates derived from the SWICS (2012) study.

Table 8. Values of OX_i to be applied based on the measurements of J_out

J_out (gCH4/m².d)	OX_i (Central Estimate) (a)	Uncertainty (a)
Lower than 10	0.384	+/- 8%
Between 10 and 70	0.274	+/- 12%
Above 70	0.124	+/- 45%

(a) Source: SWICS (2012). Uncertainties are based on the standard error, multiplied by 1.96 and divided by the mean.

(b) Monitoring Frequency: Activity participants may choose to:

(i) **(Option B.1):** Monitor J_out annually and update OXy accordingly.

(ii) **(Option B.2):** Monitor J_out once prior to the start of each crediting period. The resulting OXy value shall be used for the whole crediting period, unless any changes to the cover are made. If changes occur, the flux must be re-measured in the affected zone(s).

92. Where Option B is used (or Option A for heterogeneous sites), OXy is determined as the weighted average value based on the size of each zone i (or cover type i), as follows:

$OXy = \Sigma (OX\_i \times Area\_i / Area\_Total)$ *(Equation 5)*

Where:

OXy = Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline scenario (dimensionless)

OXi = Average oxidation factor for the zone i (**or cover type i)**

Areai = Surface area of the zone i (m²)

AreaTotal = Surface area of the entire SWDS (m²)

i = Zones of the SWDS (or cover types)