GLOBAL STAKEHOLDER CONSULTATION FORM FOR PROPOSED NEW BASELINE AND MONITORING METHODOLOGY OR METHODOLOGICAL TOOL (version 01.0)

Name of submitter	Dr Injy Johnstone
Affiliated organization of submitter (if any)	Max Planck Institute
Email of submitter	Injy.johnstone@ip.mpg.de
Reference number of proposed new methodology or methodological tool	A6.4-PMM008 - Leak detection and repair in natural gas transmission and distribution systems
Based on an assessment of information in the A6.4-FORM-METH-002 and its application in sections A to C of the submitted draft project design document (A6.4-FORM-AC-020), provide your comments to the proposed new methodology using the tabular format below. Please indicate the sections or issues to which your comments refer to.	
Date received by the secretariat	

#	Section / Para no./ Annex / Figure / Table	Type of comment **ge** = general **te** = technical **ed** = editorial	Comment (including justification for change)	Proposed change (including proposed text)
1	Methodology sections 10.3, 10.5 and 13; Eq. 6, 6.1 and 12; PDD B.8.1.2, B.8.4	te	The downward adjustment equations are internally inconsistent and risk either severe under-crediting or over crediting depending on implementation. The methodology defines AF_y as a remaining percentage after a downward adjustment, then multiplies BE_DA by AF_y again in Eq. 12. The PDD also states BE_DA,y = BE_Act,y x (1 - AF_y), which is inconsistent with AF_y being 100% minus the adjustment. This is an essential issue because the adjustment is the core Article 6.4 Safeguard for alignment with para 33 of the PACM's RMP. Heavy-tailed methane emissions mean that formula errors can materially affect credited volumes (Brandt et al., 2016; Alvarez et al., 2018).	Revise all equations so the downward adjustment is applied once only and define AF_y unambiguously as either the downward-adjustment rate or the remaining creditable fraction. Proposed text: "Let DA_y be the cumulative downward-adjustment rate in year y. Let CF_y = 1 - DA_y be the creditable fraction. Downward-adjusted baseline emissions are BE_DA,y = BE_Act,y x CF_y. Emission reductions are ER_y = min(BE_DA,y, BAU_cons,y) - PE_y - LE_y. AF_y shall not be applied a second time." Add a worked example for all 10 crediting years.
2	Methodology section 10.4.1; Eq. 8 and 9; PDD B.8.1.3	te	The conservative BAU equation appears dimensionally and mathematically wrong: BAU_cons,min,y = BAU_y x (BAU_y - AE_y) x 0.1 yields units of tCO2e squared. The corresponding Article 6.4 baseline standard concept appears to require a 10% reduction of the difference between BAU and activity emissions, not multiplication of emissions by emissions. A mathematical error here would undermine the comparison between the downward-adjusted baseline and conservative BAU baseline.	Correct Eq. 8 to: BAU_cons,min,y = BAU_y - (BAU_y - AE_y) x 0.1. Then define BAU_cons,y = min(BAU_cons,UNC,y, BAU_cons,min,y). Require activity participants to show the calculation in both ex ante and ex post monitoring reports.
3	Applicability section 5; Activity boundary section 8; PDD B.2 and B.4	te	The methodology is inconsistent on whether eligible components must be included at validation, first verification, or initial survey. The simplified summary excludes new leaks on components not part of the project boundary at first verification, while the PDD states components are included at validation. This ambiguity creates risk of boundary expansion and selective inclusion of newly discovered high emitters. Peer-reviewed evidence shows gas leak distributions are heavy-tailed, with a small number of sources responsible for a disproportionate share of emissions; this makes boundary definition especially material (Brandt et al., 2016; Alvarez et al., 2018).	Use one fixed eligibility date. Proposed text: "The project boundary shall be fixed at validation. Only components physically present, uniquely identified and recorded in the validated boundary database before the first crediting period monitoring campaign are eligible. New infrastructure, extensions, and components added after validation are excluded. New leaks on validated components may be credited only from the date of verified detection and measurement."

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4	Monitoring parameters FCH4,j, FCH4,z; section 14/15; PDD B.9.1	te	The methodology allows “LMD or other volumetric methane measuring device” but does not distinguish detection instruments from quantitative flux measurement instruments. A laser methane detector (LMD) generally detects concentration path-integral signals, not volumetric leak flow. Recent intercomparison work demonstrates that methane quantification methods have method specific biases and uncertainties, and suction/encapsulation methods differ from rapid remote methods (Maazallahi et al., 2023). This is critical because baseline emissions are entirely measurement based.	Specify eligible quantification methods and validation criteria. Proposed text: “Only instruments or methods that directly quantify methane mass or volume flow rate at the component level and have a documented uncertainty for the relevant flow range may be used for FCH4. Detection-only instruments, including LMDs or OGI cameras, may identify leaks but shall not be used to quantify FCH4 unless paired with an approved quantification protocol. The PDD shall list instrument model, flow range, lower detection/quantification limit, calibration gas, uncertainty at 95% confidence, and operating constraints.”
5	Monitoring parameters FCH4,j, FCH4,z and URj/URz; PDD B.9.1	te	The methodology relies heavily on Hi-Flow sampler measurements but does not include safeguards for known high-flow sampler sensor transition and calibration problems. Howard et al. (2015) documented underestimation risks in commonly used high-flow samplers linked to sensor transition failure, calibration age, firmware and gas composition. Assuming +/-10% uncertainty without verification can therefore be insufficient and non-conservative for some devices and operating conditions.	Add mandatory QA/QC for high flow measurements. Proposed text: “Where a high flow sampler is used, the operator shall document firmware version, calibration within a maximum of 14 days unless manufacturer evidence supports a longer interval, pre and post survey zero/span checks, methane composition compatibility, and confirmation that no sensor transition error occurred. For measurements near instrument range limits or where capture is incomplete, the leak shall be remeasured by an independent quantitative method or excluded.”
6	Project emissions section 11.1; monitoring Tz/Tj,z; PDD B.7 and B.9	te	Project emissions from reappeared leaks are likely understated because the methodology credits a repaired leak until a later survey detects recurrence, but Tz is described only as time after monitoring measurement. Recurrence or new leaks can occur between annual surveys. Ravikumar et al. (2020) found that >90% of initially repaired leaks were not emitting at resurvey, yet fugitive emissions fell only 22% because new leaks arose between surveys, demonstrating the importance of inspection frequency and temporal assumptions.	Define conservative temporal attribution. Proposed text: “If a repaired leak or a new leak on an eligible component is detected during monitoring, it shall be assumed to have emitted from the midpoint between the current and previous successful inspection unless the participant provides auditable evidence of a later start date. Where monitoring is annual or less frequent, the default shall be from the previous inspection date. The methodology shall require at least semi annual monitoring for components that represented the top 5% of baseline emissions, or otherwise apply a conservative recurrence discount.”

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7	Baseline and BAU calculation; sections 10.2 and 10.4; PDD B.5 and B.8	te	The assumption that baseline leaks would continue unchanged for the full crediting period until component replacement is insufficiently conservative. Leak rates are stochastic and heavy tailed, and large leaks can dominate totals; persistence assumptions therefore materially affect crediting (Brandt et al., 2016). Conversely, some leaks may self-seal, be repaired for safety, or be removed by ad hoc maintenance. The PDD relies largely on interviews and general budget arguments rather than enforceable evidence of expected persistence for each component class.	Require component class specific persistence evidence and attrition. Proposed text: “For each component class, participants shall justify the assumed leak persistence using historical maintenance logs, emergency repair records, replacement records and pressure operation records for at least three years before the activity. Unless project specific evidence supports a lower value, baseline emissions shall be reduced by an annual attrition factor reflecting the probability of repair, replacement, depressurization or removal under BAU. The attrition factor shall be validated and updated ex post.”
8	Additionality sections 9.3, 9.3.1, 9.3.2; PDD B.6.3 and B.6.4	te	The proposed barrier-analysis option is too permissive and may allow crediting of measures that are economically attractive or increasingly common. Methane abatement can be highly cost-effective where gas has value, while financial flows may vary by utility. The PDD states gas savings do not create revenue but also presents substantial leak reductions; this requires a transparent financial model rather than general assertions. Article 6.4 additionality must be demonstrated from the perspective of the implementing entity and must show the mechanism is decisive.	Require a quantified additionality test in all cases. Proposed text: “Barrier analysis may supplement but not replace a quantified financial assessment. Activity participants shall provide a cash-flow model from the perspective of the gas utility and any project investor, including gas purchase/sale price, subsidy treatment, unaccounted-for-gas rules, OPEX, CAPEX, carbon revenue, financing terms and sensitivity analysis. Barrier-only justification is acceptable only where the DOE validates that gas savings cannot legally, contractually or practically accrue to the implementing entity.”

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9	Avoidance of double counting section 6; PDD B.3	te	The PDD notes that the project was previously CDM, has transitioned to Article 6.4, and is registered under Verra with credits issued in 2021 and 2022. The proposed methodology states that overlapping claims can be addressed by an agreement not to double issue. A private attestation is not an adequate methodological safeguard for Article 6.4 because double issuance and double claiming require registry-level controls, serial number reconciliation, public disclosure, and host Party authorization/corresponding adjustment where applicable.	Strengthen double-counting requirements. Proposed text: “For activities previously registered under CDM, Verra or any other crediting programme, the activity participant shall provide a public registry reconciliation showing crediting periods, serial numbers issued, cancelled, retired or transferred, and a legal undertaking that no emission reduction from the same component and time period has been or will be issued elsewhere. Article 6.4 issuance shall be prohibited for any vintage with prior issuance under another registry unless those units are cancelled for the purpose of avoiding double issuance and this is verified by the DOE.”
10	PDD Basic information, A.1, B.8.6; methodology crediting-period application	te	The PDD presents a 10-year crediting period from 31/07/2020 to 30/07/2030 while also stating that only post-2025 credits are sought. The ex ante table includes 2020-2025 emission reductions. This creates ambiguity about whether the Article 6.4 activity is seeking retroactive crediting, transition crediting, or only post-2025 issuance. The methodology should not enable double counting or double crediting across CDM/Verra/Article 6.4 transition periods.	Require a clean vintage boundary. Proposed text: “The PDD and monitoring plan shall identify the first Article 6.4 crediting vintage and exclude from Article 6.4 issuance all emission reductions for any period already credited or eligible for issuance under CDM, Verra or any other programme. Ex ante tables shall separately show non-claimable historical years and claimable Article 6.4 years.”
11	Leakage section 12; PDD B.8.3	te	Setting leakage to zero may be reasonable for physical displacement, but the methodology’s rationale that all indirect effects are positive is over-stated. If repaired gas is consumed rather than reducing upstream production, downstream CO2 emissions from combustion may occur while methane emissions are avoided. Although methane benefits are likely dominant, the methodology should justify the treatment of saved gas and should not claim positive leakage without evidence. Alvarez et al. (2018) shows the climate importance of supply chain methane, but this does not eliminate the need to address end-use assumptions transparently.	Revise leakage language. Proposed text: “Leakage emissions from physical displacement of equipment or leaks are zero. The methodology does not credit potential positive upstream leakage. Participants shall describe the expected disposition of saved gas. Downstream combustion of saved gas is outside the project boundary and shall be disclosed qualitatively; where host Party accounting rules require inclusion, a conservative adjustment shall be applied.”

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12	Data management and QA/QC; PDD B.5.2 step 4 and B.9.3	te	The database concept is strong, but QA/QC requirements are not yet sufficient for a methodology where all credits depend on source-level measurements. There is no mandatory raw data retention period, independent audit trail, tamper evident record, geospatial validation tolerance, or procedure for reconciling discrepancies among photographs, tags, schematics and instrument downloads. Given measurement bias and heavy tailed distributions, data integrity controls are essential (Brandt et al., 2016; Maazallahi et al., 2023).	Add explicit data governance requirements. Proposed text: "The project database shall retain immutable raw instrument files, calibration certificates, photographs with metadata, GPS coordinates, operator identity, date/time stamps, repair material records, remeasurement results and any exclusions for at least two crediting periods after issuance. Any discrepancy among the four redundant data streams shall trigger exclusion unless resolved through a documented corrective action verified by the DOE. The DOE shall inspect a risk-based sample weighted toward the largest 5% of baseline leaks."

(Please add rows as required)

Peer Reviewed References cited in comments:

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- Howard, T. (2015). Sensor transition failure in the high flow sampler: implications for methane emission inventories of natural gas infrastructure. Energy Science & Engineering, 3(5), 409-417. https://doi.org/10.1002/ese3.81
- Maazallahi, H., et al. (2023). Intercomparison of detection and quantification methods for methane emissions from the natural gas distribution network in Hamburg, Germany. Atmospheric Measurement Techniques, 16, 5051-5073. https://doi.org/10.5194/amt-16-5
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