Joint Crediting Mechanism Guidelines for Developing Project Design Document and Monitoring Report for Carbon Capture and Storage and Carbon Capture, Utilization and Storage (CCS and CCUS)

CONTENTS

1. Scope and applicability

1. The "Joint Crediting Mechanism Guidelines for Developing Project Design Document and Monitoring Report" (hereinafter referred to as "these Guidelines") are intended to assist project participants in developing Joint Crediting Mechanism (hereinafter referred to as "JCM") project design document (hereinafter referred to as "PDD") and monitoring report.
2. These Guidelines describe standards which are requirements to be met, except guidance indicated with terms "should" and "may" as defined in paragraph 8 below.

2. Terms and definitions

3. "Project design document (PDD)" is prepared by the project participant of a JCM project and sets out the JCM project in detail, in line with the JCM rules and guidelines.
4. "Monitoring" is collecting and archiving all relevant data necessary for estimating GHG emission that are significant and reasonably attributable to a registered JCM project.
5. "Monitoring plan" sets out the methodology to be used by project participants for the monitoring of, and by third-party entities for verification of the amount of GHG emission reductions achieved by the JCM project.
6. "Monitoring report" is prepared by a project participant and sets out the GHG emission reductions of an implemented registered JCM project for a particular monitoring period.
7. "Local stakeholder consultation" is conducted to the public, including individuals, groups or communities affected, or likely to be affected, by the proposed JCM project or actions leading to the implementation of such project, and local governments.
8. The following terms apply in these Guidelines:
    (a) "Should" is used to indicate that among several possibilities, one course of action is recommended as particularly suitable;
    (b) "May" is used to indicate what is permitted.
9. Terms in these Guidelines are defined in "JCM Glossary of Terms" available on the JCM website.

3. General guidelines

10. When designing a proposed JCM project and developing a PDD and a monitoring report, project participants apply these Guidelines and the selected methodology(ies), which contain(s) approved methodology document(s) and Monitoring Spreadsheet(s).
11. The Monitoring Spreadsheet is provided as a part of each approved methodology and it consists of:
    (a) Monitoring Plan Sheet (input sheet and calculation process sheet) which is used

before validation for developing a monitoring plan and calculating emission reductions *ex ante*;

(b) Monitoring Structure Sheet which is used before validation for developing an operational and management structure to be implemented in order to conduct monitoring;

(c) Monitoring Report Sheet (input sheet and calculation process sheet) which is used before verification for developing a monitoring report and calculating emission reductions *ex post*.

12. A PDD consists of a completed PDD form and monitoring plan using Monitoring Plan Sheet and Monitoring Structure Sheet. A monitoring report is completed by using Monitoring Report Sheet.
13. The project participants provide a description of the project that provides a comprehension of the nature of the project and its implementation.
14. The project participants monitor the registered JCM project and its emission reductions. The project participants establish and apply quality management procedures to manage data and information. The project participants should reduce, as far as is practical, uncertainties related to the quantification of emission reductions.
15. These Guidelines, the PDD form, and Monitoring Spreadsheet can be obtained electronically from the JCM website.
16. The Joint Committee may revise the PDD form and the Monitoring Spreadsheet if necessary.
17. The Monitoring Spreadsheet may be revised when the corresponding approved methodology is revised.
18. The PDD form and the Monitoring Spreadsheet are completed in English language.
19. The PDD form and the Monitoring Spreadsheet are not to be altered, that is, are to be completed without modifying its format, font, headings, except for those referred in paragraph 20 below.
20. Local stakeholder consultation is to be conducted in all JCM projects and its result forms an integral part of a PDD.
21. Rows may be added to the table in the Annex of the PDD form.
22. Where a PDD contains information that the project participants wish to be treated as confidential or proprietary, the project participants are required to submit documentation in two versions:

(a) One version where all parts containing confidential or proprietary information are made illegible (e.g. by covering those parts with black ink or overwrite those parts with letters such as “XXX”) so that the version can be made publicly available without displaying confidential or proprietary information;

(b) Another version containing all information that is to be treated as strictly confidential or proprietary by all parties handling this documentation (the third-party entities, the Joint Committee members, external experts).

23. Description related to application of the eligibility criteria and the environmental impact assessment is not considered confidential or proprietary.
24. The presentation of values in the PDD, including those used for the calculation of emission reductions, should be in international standard format e.g. 1,000 representing one thousand and 1.0 representing one. The units used should be accompanied by their equivalent S.I. units/norms (thousand/million) as part of the requirement to ensure transparency and clarity.

4. Developing a PDD

In the following section, a hypothetical project is described in red color as an example to show how to fill in the PDD form, Monitoring Plan Sheet, and Monitoring Structure Sheet.

4.1. Completing a PDD form

<Example of a completed PDD>

A. Project description

A.1. Title and reference number of the project idea note (PIN) of the JCM project

Title	CCUS application for producing oil field in the Republic of Indonesia
PIN reference number	ID_PIN000

Please indicate technology(ies) applied as well as sector that the project is implemented and the reference number of the PIN which was submitted to the Joint Committee and had no objection by the Joint Committee prior to the registration request.

A.2. General description of project and applied technologies and/or measures

The proposed JCM project aims to reduce CO_2 emissions by capturing CO_2 from a gas processing plant by installing a capturing equipment, transporting it through a pipeline, and injecting it into a producing oil field in the Republic of Indonesia.

The key technology is to introduce carbon capture, utilization and storage (CCUS) to achieve GHG emission reductions. While CO_2 separated from the produced oil is currently released into the atmosphere, the project can achieve the permanent storage of CO_2 underground, which is crucial to reduce CO_2 emissions. Introducing a CCUS project will also lead to improving business viability of CCUS in Indonesia.

The project covers a producing oil field in “City X”, the Republic of Indonesia. The project is expected to capture, transport, and inject 700,000 tons of CO_2 annually.

Please include in the description:

- *The purpose of the project;*
- *Explanation of how the proposed project reduces greenhouse gas emissions (i.e. what type of technology is being employed, what measures are conducted as part of the project, etc).*

A.3. Location of project, including coordinates

Country	The Republic of Indonesia

Region/State/Province etc.:	N/A
City/Town/Community etc:	"City X"
Latitude, longitude	Producing oil field: N 10° 10' 00" and E 100° 10' 00"

A.4. Name of project participants

The Republic of Indonesia	XYZ Petroleum Company Limited
Japan	ABC Company Limited

Please name all project participants from the Republic of Indonesia and Japan in corresponding cell.

A.5. Duration

Starting date of project operation	01/04/2021
Expected operational lifetime of project	10 years
Duration of crediting period	A period from which the project participants of a JCM project start injection of CO_2 into a reservoir and to which the project participants terminate the injection of CO_2 collected through the JCM project.
Starting date of crediting period (input the information when requesting a renewal of crediting period)	DD/MM/YYYY

Please provide starting date in DD/MM/YYYY and operational lifetime in years and months.
The starting date of a JCM project is the date on which the operation of a project begins.
Expected operational lifetime may be explained with publicly available statistical data, reference data from similar projects, legal durable years, expert judgment, etc.
Please note the crediting period for CCS and CCUS projects refers to a period from which the project participants of a JCM project start injection of CO_2 into a reservoir and to which the project participants terminate the injection of CO_2 collected through the JCM project.

A.6. Contribution from Japan

The CCUS technology which has been developed by the Japanese project participant is introduced in the proposed project. The Japanese project participant transfers the technology through training to the Indonesian project participants.

The Japanese side provides financial support to the project.

Please include explanation of how Japan contributes to implementation of the project (i.e. finance, technology, training, support for O&M, etc).

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	JCM_ID_AM001
Version number	Ver. 01.0
Selected approved methodology No.	N/A
Version number	N/A
Selected approved methodology No.	N/A
Version number	N/A

Please name approved methodology(ies) number and its version number applied to the proposed JCM project.

B.2. Explanation of how the project meets eligibility criteria of the approved methodology

Eligibility criteria	Descriptions specified in the methodology	Project information
Criterion 1	Currently, CO_2 is separated from the produced oil in the field and released into the atmosphere. The aim of the project is to capture, transport, and inject CO_2 into a producing or depleted oil field.	CO_2 is currently separated from the produced oil and released into the atmosphere. This CO_2 is captured, transported, and injected into a producing oil field.
Criterion 2	The CO_2 used for raw material or injected into the ground is excluded.	The CO_2 is currently released into the air.
Criterion 3	Measures are taken to ensure safe and long-term storage in accordance with relevant national and/or local regulations and/or international standards such as ISO27914 or any standard that standard that succeeds it. Items to be checked include presence of caprock, absence of active faults, information about abandoned wells, integrity of existing producing wells, well	The continuous caprock over the oil reservoir was confirmed by geological structure analysis based on the past 3D seismic surveys. No active faults were found by geological structure analysis based on the past 3D seismic surveys.

	design and closure plan for injection well(s).	
Criterion 4	The CCS and CCUS implementation plan requires that the amount of CO_2 injected does not exceed the maximum injection capacity, which is determined by geological information of the storage reservoir so that CO_2 plume will not reach the spill point. This is also confirmed at verification timing after the project starts. Reservoir simulations for this purpose are updated as necessary based on monitoring results on production and injection. If monitoring results such as bottomhole pressure significantly differs from initial assumptions, the simulation should be updated to improve accuracy based on newly monitored and measured data.	To be conducted.
Criterion 5	The CCS and CCUS implementation plan requires that CO_2 injection is operated at pressure below 90% of the caprock fracturing pressure, and that the amount of injected CO_2 is less than the cumulative oil production. This is also confirmed at verification timing after the project starts.	To be conducted.
Criterion 6	N/A	N/A
Criterion 7	N/A	N/A
Criterion 8	N/A	N/A
Criterion 9	N/A	N/A
Criterion 10	N/A	N/A

Please copy all descriptions specified in the applied methodology for each criterion.
Then explain how the project meets each eligibility criterion with project detailed information.

C. Calculation of emission reductions

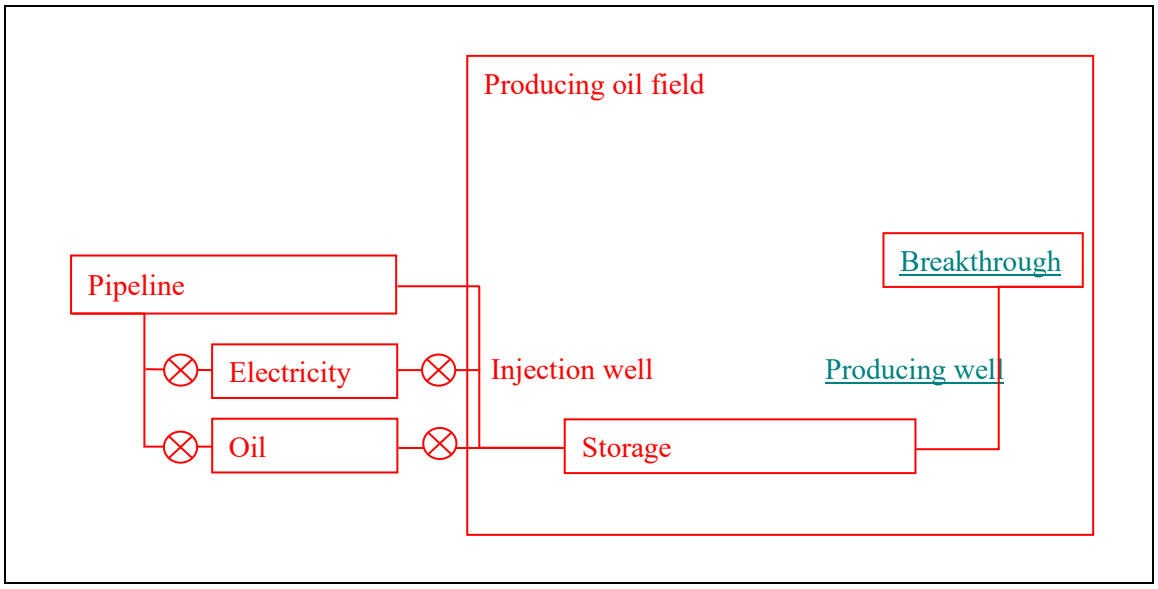
C.1. All emission sources and their associated greenhouse gases relevant to the JCM project

Reference emissions	
Emission sources	GHG type

CO_2 separated from the produced oil	CO_2
Breakthrough CO_2 from producing wells	CO_2
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A
Project emissions	
Emission sources	GHG type
CO_2 associated energy consumption in transport and injection	CO_2
CO_2 associated electricity consumption in transport and injection	CO_2
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

Please list all emission sources and GHG types that are included in calculation of reference emissions and project emissions.
Please indicate in the description of "emission sources":
- Energy consumption facilities;
- Energy type;
For "GHG type" choose from CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3.
If the project involves more than one component, a separate table is to be provided in the Annex for each component or each approved methodology that is applied.

C.2. Figure of all emission sources and monitoring points relevant to the JCM project



Please illustrate and describe all emission sources relevant to the project. Please also indicate all monitoring points for measurement with types of equipment to be installed for the proposed project in the figure. Each monitoring point for measurement should be indicated with monitoring point number(s) corresponding to the number of parameters listed in the Monitoring Plan Sheet.*

In selecting a monitoring point for measurement, the project participants should select the most suitable position in order to collect the accurate data. In many cases, the monitoring point for measurement corresponds to the position of the measuring equipment, however, when the amount of transaction is used to collect activity data, the receiving inlet of fuel at the factory/place of business operations such as a fuel tank serves as monitoring point. In addition, it is not always necessary for the emission source to correspond to the monitoring point in a one-to-one manner. It is possible to monitor the activity data of two or more sources at a point; it is also possible to monitor the activity data of one source at two or more points. In either case, monitoring points for measurements should be decided to increase the accuracy of measurement.

** If monitoring option B or C as referred to paragraph 27(b) is selected.*

C.3. Estimated emissions reductions in each year

Year	Estimated Reference emissions (tCO_2e)	Estimated Project Emissions (tCO_2e)	Estimated Emission Reductions (tCO_2e)	Estimated amount of emission reductions put in reserve account (tCO_2e)
2021	700,000	16,000	684,000	

2022	700,000	16,000	684,000	
2023	700,000	16,000	684,000	
2024	700,000	16,000	684,000	
2025	700,000	16,000	684,000	
2026	700,000	16,000	684,000	
2027	700,000	16,000	684,000	
2028	700,000	16,000	684,000	
2029	700,000	16,000	684,000	
2030	700,000	16,000	684,000	
Total (tCO_2e)			6,840,000	

Note:
The estimated emission reductions in each year are rounded down after the decimal point.

Please summarize the results of the ex-ante estimation of emission reductions for all years of the period, using the table above. If the project activity involves more than one component, only the table showing the aggregate emission reductions of the project is provided in this section. Separate tables for each component or each approved methodology that is applied are provided in Annex. Please also input the estimated emission reductions in each year by rounding down after the decimal point. While the estimated value of emission reductions at the time of validation may differ from the value to be verified, please calculate them in line with the methodology(ies) to be applied to the proposed project and based on assumptions on e.g. activity volume by the project. Such assumption may be made from statistical data, expert judgement or averaging past activity data.

D. Environmental impact assessment	
Legal requirement of environmental impact assessment for the proposed project	NO

The project participants should refer relevant documents of environmental impact assessment including the Frame of Reference for environmental impact assessment prepared by the Indonesian side.
Please select YES or NO depending on whether the proposed project is subject to an environmental impacts assessment according to national or local regulations.
If the project participant selects YES, the conclusions of environmental assessment are attached.

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

…The project participants posted notices regarding the stakeholders' meeting two weeks prior to the meeting. The stakeholders' meeting was held on YY/XX/2021 during 10:00-12:00 hours at the project site.

Local stakeholder consultation is conducted to solicit comments from stakeholders and to disseminate JCM program scheme for promoting GHG mitigation activities.
Please describe the process by which comments from local stakeholders have been invited for the proposed project. Stakeholder consultations under an environmental impact assessment may be recognized as JCM local stakeholder consultations.
Project participants have a meeting with the local government(s) of the project location as a part of local stakeholder consultations.

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
Local authority	Such emission reduction measures comply with energy policies in the Republic of Indonesia and are very much encouraged.	No action is needed.
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A

Please identify stakeholders that have made comments and provide a summary of these comments.
Please explain how due account have been taken of comments received.

F. Arrangements for post-project termination monitoring

Please specify monitoring arrangements for the period after the termination of the JCM Project, including the roles and responsibilities of the project participants and other relevant stakeholders.

G. References

Energy Statistics 2010

Regulation No. 2 of 2023 on the implementation of CCS and CCUS in Upstream Oil and Natural Gas Business Activities (MEMR 2/2023)

Reference lists to support descriptions in the PDD, if any.

Annex

Please provide separate tables for section C.1 and C.3 and further information related to other sections, if necessary.

Revision history of PDD

Version	Date	Contents revised
01.0	01/04/2021	First edition

4.2. Developing a Monitoring Plan

25. Project participants develop before validation a monitoring plan using Monitoring Plan Sheet and Monitoring Structure Sheet in the corresponding Monitoring Spreadsheet of the methodology applied.
26. Project participants input estimated values for each parameter in the Monitoring Plan Sheet including those fixed ex ante for parameters not to be monitored.
27. Project participants also describe the following items for each parameter specified in the Monitoring Plan Sheet in line with the applied methodology(ies). Project participants may add detailed information specific to the proposed project to the contents given in the applied methodology.
    (a) Estimated values: Provide the estimated values of the parameter for the purpose of calculating emission reductions *ex ante*;
    (b) Monitoring option: Select an option from below;
        (i) Option A: Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications);
        (ii) Option B: Based on the amount of transaction which is measured directly using measuring equipment (Data used: commercial evidence such as invoices);
        (iii) Option C: Based on the actual measurement using measuring equipment (Data used: measured values).
    (c) Source of data: Provide the source of data used or to be used. Clearly indicate the type of data source (e.g. logbooks, daily records, surveys, etc.) and spatial level of data (e.g. local, regional, national, international), if applicable;
    (d) Measurement methods and procedures: Describe how the parameters are to be measured/calculated including Quality Assurance/Quality Control (hereinafter referred to as "QA/QC") procedures applied. If the parameter will be measured, describe the equipment to be used to measure it, including details on accuracy level, and calibration information (frequency, date of calibration and validity) in line with section 4.3 below;
    (e) Monitoring frequency: Describe the monitoring frequency (e.g. continuously, annually).
28. The project participants ensure that data monitored and required for verification and issuance be kept and archived electronically for two years after the final issuance of credits.
29. In the Monitoring Structure Sheet, the project participants describe the operational and management structure to be implemented in order to conduct monitoring. The project

participants establish and clearly indicate the roles and responsibilities of personnel, institutional arrangements, and procedures for data collection, archiving and reporting.

30. The project participants appoint a person who is responsible for overall monitoring activity including preparation of the monitoring report, and managing and archiving of data. The responsible person for monitoring:
    (a) Ensures the quality of the monitoring report and the structure and procedure for producing such a document;
    (b) Appoints a person(s) responsible for managing monitoring points, when necessary, to collect data and maintain and control measuring instruments (including calibration/regular inspection) at monitoring points.

4.3. Preparing for actual measurement

31. For monitoring of parameters under Option C (i.e. parameters monitored through actual measurement), the project participants determine the frequency of calibration following the paragraphs 32, 33 and 34 below, unless otherwise stated in the applied methodology, and describe the frequency in the Monitoring Plan Sheet in line with paragraph 27(d).
32. The project participants confirm whether national laws and regulations on measurement exist for parameters under Option C.
33. Regarding parameters for which corresponding national laws and regulations on measurement exist, measuring equipment for those parameters are to be calibrated and/or qualified in accordance with the laws and regulations.
34. Regarding parameters for which national laws and regulations on measurement do not exist, measuring equipment are to be calibrated in line with international standards or manufacturers' specification.

<Example of a Monitoring Plan Sheet (Input Sheet)>

JCM Monitoring Plan Spreadsheet (Input Sheet) [Attachment to Project Design Document]

Table 1: Parameters to be monitored *ex post*

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Monitoring point No.	Parameters	Description of data	Estimated Values	Units	Monitoring option	Source of data	Measurement methods and procedures	Monitoring frequency	Other comments
(1)	$CO_{2inj,p}$	CO_2 injected during the period *p*	700,000	tCO_2/p	Option C	monitored data	- Measuring flow rate of oil injected through orifice flow meter, etc. - Measuring CO_2 concentration of oil injected through oil concentration analyzer	continuous	
(2)	Q_p	Oil produced during the period *p*	279,000	kl/p	Option C	monitored data	- Measuring produced oil data through orifice flow meter, etc.	continuous	
(3)	$C_{CO2,p}$	Average CO_2 concentration of the produced oil for the period *p*	20	%	Option C	monitored data	- Conducting oil sampling and measurement by oil chromatography, etc. - Sampling intervals are to be optimized based on changes in CO_2 concentration	periodic	
(4)	$PFC_{O,p}$	Project consumption of oil associated with transport and injection during the period *p*	0	kl/p	Option B	purchase records or monitored data	- Collecting purchase amount through fuel bill or changes in fuel stock	N/A	
(5)	PEC_p	Project electricity consumption associated with transport and injection during the period *p*	19,000	MWh/p	Option B or Option C	purchase records or monitored data	- Collecting electricity consumption data through electricity bill or real-time measurement by watt-hour meter	N/A	

Table 2: Project-specific parameters to be fixed *ex ante*

(a)	(b)	(c)	(d)	(e)	(f)
Parameters	Description of data	Estimated Values	Units	Source of data	Other comments

Table3: *Ex-ante* estimation of CO_2 emission reductions

CO_2 emission reductions	Units
684,000	tCO_2/p

[Monitoring option]

Option A	Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
Option B	Based on the amount of transaction which is measured directly using measuring equipment (Data used: commercial evidence such as invoices)
Option C	Based on the actual measurement using measuring equipment (Data used: measured values)

<Example of a Monitoring Structure Sheet>

Monitoring Spreadsheet: JCM_XX_AM001_ver01.0

Monitoring Structure Sheet [Attachment to Project Design Document]

Responsible personnel	Role
Project Manager	Responsible for project planning, implementation, monitoring results and reporting.
Project Deputy Managers	Appointed to be in charge of approving the archived data after being checked and corrected when necessary.
Facility Managers	Appointed to be in charge of monitoring procedure (data collection and storage), including monitoring equipment and calibrations, and training of monitoring personnel.
Operators	Appointed to be in charge of checking the archived data for irregularity and lack.
N/A	N/A
N/A	N/A
N/A	N/A

5. Monitoring

5.1. Conducting monitoring

35. Project participants conduct monitoring in line with the monitoring plan of the registered PDD.

5.2. Data correction for actual measurement

36. For monitoring of parameters under Option C (i.e. parameters monitored through actual measurement), the project participants calibrate measuring equipment as per the monitoring plan.
37. The project participants determine the necessity for data correction in calculation of emission reductions following the decision tree shown in Figure 1 below.
38. Regarding parameters for which corresponding national laws and regulations on measurement exist, the project participants:
    (a) Apply measured values (uncorrected values) to those parameters in calculation of emission reductions, if measuring equipment are calibrated and/or qualified in accordance with the national laws and regulations on measurement;
    (b) Do not apply measured values in calculation of emission reductions for that monitoring period, if measuring equipment are not calibrated and/or qualified in accordance with the national laws and regulations on measurement.
39. Regarding parameters for which national laws and regulations on measurement do not exist, the project participants check whether the instrumental errors identified in the calibration test stay within the required level of accuracy (i.e. ±5%).
40. For parameters described in paragraph 39, if measuring equipment are calibrated in line with the monitoring plan, the project participants:
    (a) Apply measured values (uncorrected values) to those parameters in calculation of emission reductions, where the instrumental errors of the measuring equipment stay within ±5%;
    (b) Correct measured values by applying the difference resulted from the instrumental error and required level of accuracy to the measured values during the period between the date of the previous calibration and the concerned calibration, in line with the Appendix to these Guidelines, and apply the corrected values to those parameters in calculation of emission reductions, where the instrumental errors of the measuring equipment do not stay within ±5%.
41. For parameters described in paragraph 39, if measuring equipment are not calibrated in line with the monitoring plan, but calibration is implemented after the scheduled date, the project participants:

(a) Apply measured values (uncorrected values) to those parameters in calculation of emission reductions, where the instrumental errors identified in the delayed calibration test stay within ±5%;

(b) Correct measured values by applying the difference resulted from the instrumental error identified in the delayed calibration and required level of accuracy to the measured values during the period between the date of previous calibration and the actual date of calibration in line with the Appendix to these Guidelines, and apply the corrected values to those parameters in calculation of emission reductions, where the instrumental errors identified in the delayed calibration test do not stay within ±5%.

42. Correction of values in line with paragraph 40(b) and 41(b) are conducted in a manner which results in a conservative calculation of emission reductions, as shown in the Appendix.

43. For parameters described in paragraph 39, if measuring equipment are not calibrated in line with the monitoring plan and calibration is not implemented after the scheduled date, the project participants do not apply measured values in calculation of emission reductions for that monitoring period.

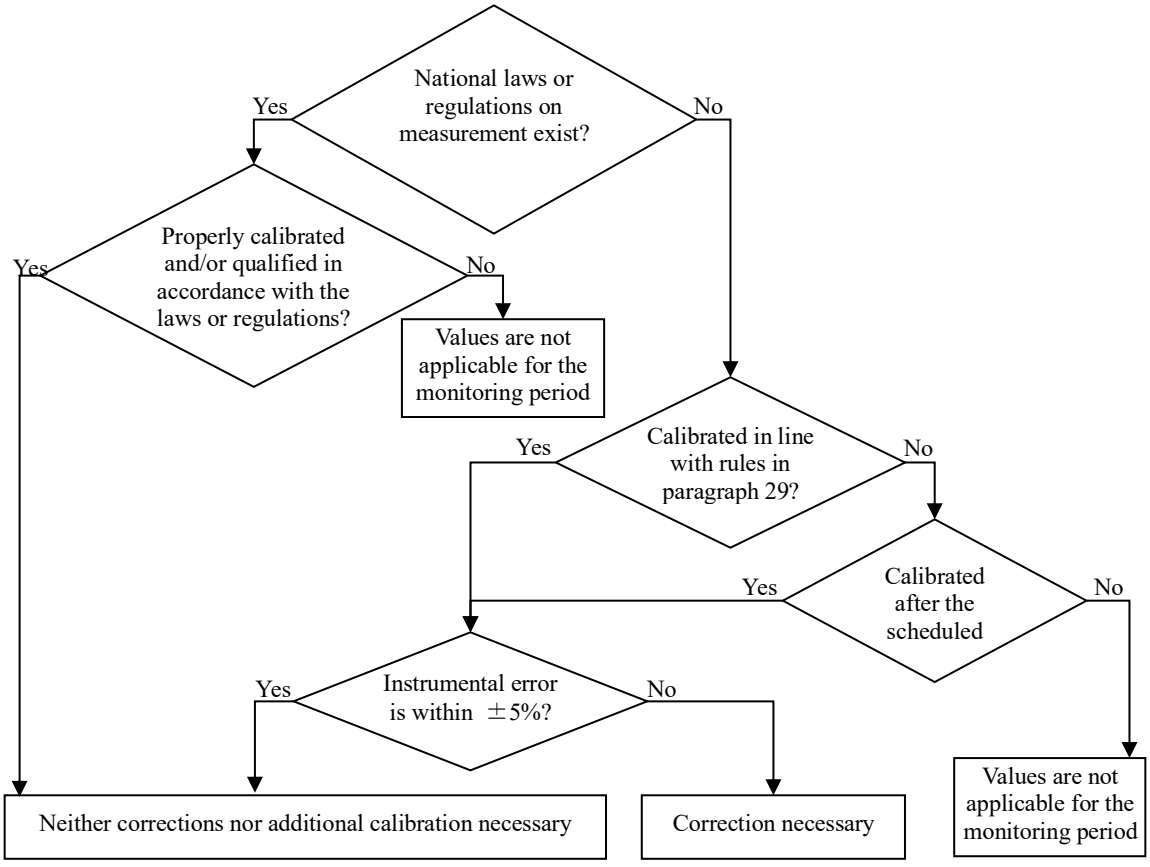


Figure 1 Decision tree for data correction

5.3. Recording and archiving data

44. The project participants record and archive the data as per the monitoring plan.
45. When conducting monitoring, the project participants archive the evidence and records that validate the figures to be stated in the monitoring report(s). It includes the source documents that form the basis for calculations and other information underlying the emission reductions.

6. Developing a Monitoring Report

46. The project participants develop a monitoring report using the Monitoring Report Sheet applied to the registered JCM project.
47. For each parameter in the Monitoring Report Sheet, the project participants describe appropriate information corresponding to the following items:
    (a) Monitoring period: Describe the monitoring period;
    (b) Monitored values: Provide the values of the monitored parameter for the purpose of calculating emission reductions;
    (c) Monitoring option: Fill in the monitoring option used;
    (d) Source of data: Provide the source of data used. Clearly indicate the type of data source (e.g. logbooks, daily records, surveys, etc.) and spatial level of data (e.g. local, regional, national, international), if applicable;
    (e) Measurement methods and procedures: Describe how the parameters are measured/calculated including QA/QC procedures applied. If the parameter is measured, describe the equipment used to measure it, including details on accuracy level, and calibration information (frequency, date of calibration and validity);
    (f) Monitoring frequency: Describe the monitoring frequency.
48. The project participants should describe reason(s) if the calculated CO_2 emission reductions in the Monitoring Report Sheet unexpectedly differ from those which were estimated at the time of validation.

<Example of a Monitoring Report Sheet>

Monitoring Spreadsheet JCM_ID_AM001_ver01.0

JCM Monitoring Report Spreadsheet (Input Sheet) [For Verification]

Table 1: Parameters to be monitored *ex post*

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Monitoring period	Monitoring point No.	Parameters	Description of data	Estimated Values	Units	Monitoring option	Source of data	Measurement methods and procedures	Monitoring frequency	Other comments
//2021-**/**/2022	(1)	$CO_{2inj,p}$	CO_2 injected during the period *p*	70,000	tCO_2/p	Option C	monitored data	- Measuring flow rate of oil injected through orifice flow meter, etc. - Measuring CO_2 concentration of oil injected through oil concentration analyzer	continuous	
//2021-**/**/2022	(2)	Q_p	Oil produced during the period *p*	279,000	kl/p	Option C	monitored data	- Measuring produced oil data through orifice flow meter, etc.	continuous	
//2021-**/**/2022	(3)	$C_{CO2,p}$	Average CO_2 concentration of the produced oil for the period *p*	20	%	Option C	monitored data	- Conducting oil sampling and measurement by oil chromatography, etc. - Sampling intervals are to be optimized based on changes in CO_2 concentration	periodic	
//2021-**/**/2022	(4)	$PFC_{O,p}$	Project consumption of oil associated with transport and injection during the period *p*	0	kl/p	Option B	purchase records or monitored data	- Collecting purchase amount through fuel bill or changes in fuel stock	N/A	
//2021-**/**/2022	(5)	PEC_p	Project electricity consumption associated with transport and injection during the period *p*	20,000	MWh/p	Option B or Option C	purchase records or monitored data	- Collecting electricity consumption data through electricity bill or real-time measurement by watt-hour meter	N/A	

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Table 2: Project-specific parameters to be fixed *ex ante*

(a)	(b)	(c)	(d)	(e)	(f)
Parameters	Description of data	Estimated Values	Units	Source of data	Other comments

Table3: *Ex-ante* estimation of CO_2 emission reductions

Monitoring period	CO_2 emission reductions	Units
//2021-**/**/2022	683,000	tCO_2/p

[Monitoring option]

Option A	Option A	Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
Option B	Option B	Based on the amount of transaction which is measured directly using measuring equipment (Data used: commercial evidence such as invoices)
Option C	Option C	Based on the actual measurement using measuring equipment (Data used: measured values)

Appendix: Accuracy Level and Calibration

1. The following provides an illustrative example for applying the provisions in paragraphs 40 and 41 on the treatment of monitored parameters for which national laws and regulations on measurement do not exist.
2. A hypothetical biomass power generation project is envisaged. The project generates electricity from biomass fuel and supplies it to the grid system. The project consumes diesel oil for a start-up and auxiliary fuel source to meet the required level of output. In this example, emission reductions are calculated as the difference between reference emissions calculated by multiplying electricity generated and emission factor of the grid, and project emissions calculated by multiplying diesel oil consumed and its emission factor.
3. If the instrumental errors identified in the calibration test do not exceed ±5%, then no correction is needed. An example is shown in example 1
4. If the instrumental errors identified in the calibration test exceeds ±5%, then a correction to the measured values is applied. The degree of correction is the identified errors minus 5%, in a way that results in a conservative calculation of emission reductions. An example is shown in example 2

Example 1: When the instrumental errors identified in the calibration test do not exceed ±5%

Measured value	Parameter	Error identified during (delayed) calibration	Applied values
100 MWh	Electricity supplied to the grid (required parameter for calculating reference emissions)	±0.2%	100MWh (uncorrected), since the error identified by calibration is less than or equal to the required accuracy level of ±5%, no correction needed
800 liters of diesel	Diesel flow to the power plant (required parameter for calculating project emissions)	±2%	800 liters (uncorrected), since the error identified by calibration is less than or equal to the required accuracy level of ±5%, no correction needed

Example 2: When the instrumental errors identified in the calibration test exceeds ±5%

Measured value	Parameter	Error identified during (delayed) calibration	Applied values
100 MWh	Electricity supplied to the grid (required parameter for calculating reference emissions)	±7%	100MWh*(1-(7%-5%))=98MWh, since the error identified by calibration is more than the required accuracy level of ±5%, and it is conservative to take the lower end of the corrected value..
800 liters of diesel	Diesel flow to the power plant (required parameter for calculating project emissions)	±10%	800 liters *(1+(10%-5%))=840 liters, since the error identified by calibration is more than the required accuracy level of ±5%, and it is conservative to take the higher end of the corrected value.