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Application of the Oeko-Institut/WWF-US/ EDF methodology for assessing the quality of carbon credits

This document presents results from the application of a methodology, developed by Oeko-Institut, World Wildlife Fund (WWF) and Environmental Defense Fund (EDF), for assessing the quality of carbon credits. The methodology is applied by Oeko-Institut with support by Carbon Limits, Greenhouse Gas Management Institute (GHGMI), INFRAS, Stockholm Environment Institute, and individual carbon market experts. This document evaluates one specific criterion or sub-criterion with respect to a specific carbon crediting program, project type, quantification methodology and/or host country, as specified in the below table. Please note that the CCQI website Site terms and Privacy Policy apply with respect to any use of the information provided in this document. Further information on the project and the methodology can be found here: www.carboncreditquality.org

Sub-criterion:	1.3.2 Robustness of the quantification methodologies applied to determine emission reductions or removals
Project type:	Recovery of associated gas from oil fields
Quantification methodology:	Clean Development Mechanism (CDM) AM0009, Version 7.0, and relevant tools
Assessment based on carbon crediting program documents valid as of:	15 May 2022
Date of final assessment:	31 January 2022
Score:	4

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Assessment

Relevant scoring methodology provisions

The methodology assesses the robustness of the quantification methodologies applied by the carbon crediting program to determine emission reductions or removals. The assessment of the quantification methodologies considers the degree of conservativeness in the light of the uncertainty of the emission reductions or removals. The assessment is based on the likelihood that the emission reductions or removals are under-estimated, estimated accurately, or over-estimated, as follows (see further details in the methodology):

Assessment outcome	Score
It is very likely (i.e., a probability of more than 90%) that the emission reductions or removals are underestimated, taking into account the uncertainty in quantifying the emission reductions or removals	5
It is likely (i.e., a probability of more than 66%) that the emission reductions or removals are underestimated, taking into account the uncertainty in quantifying the emission reductions or removals OR The emission reductions or removals are likely to be estimated accurately (i.e., there is about the same probability that they are underestimated or overestimated) and uncertainty in the estimates of the emission reductions or removals is low (i.e., up to ±10%)	4
The emission reductions or removals are likely to be estimated accurately (i.e., there is about the same probability that they are underestimated or overestimated) but there is medium to high uncertainty (i.e., ±10-50%) in the estimates of the emission reductions or removals OR It is likely (i.e., a probability of more than 66%) or very likely (i.e., a probability of more than 90%) that the emission reductions or removals are overestimated, taking into account the uncertainty in quantifying the emission reductions or removals, but the degree of overestimation is likely to be low (i.e., up to ±10%)	3
The emission reductions or removals are likely to be estimated accurately (i.e., there is about the same probability that they are underestimated or overestimated) but there is very high uncertainty (i.e., larger than ±50%) in the estimates of the emission reductions or removals OR It is likely (i.e., a probability of more than 66%) or very likely (i.e., a probability of more than 90%) that the emission reductions or removals are overestimated, taking into account the uncertainty in quantifying the emission reductions or removals, and the degree of overestimation is likely to be medium (±10-30%)	2
It is likely (i.e., a probability of more than 66%) or very likely (i.e., a probability of more than 90%) that the emission reductions or removals are overestimated, taking into account the uncertainty in quantifying the emission reductions or removals, and the degree of overestimation is likely to be large (i.e., larger than ±30%)	1

Information sources considered

1 CDM large-scale methodology AM0009, version 7.0.

2 Tool 02: Combined tool to identify the baseline scenario and demonstrate additionality – Version 7.0

Assessment outcome

The methodology AM0009, Version 7.0, applied in combination with CDM TOOL02, Version 7.0, is assigned a score of 4.

Justification of assessment

Project type

This assessment refers to the following project type:

Recovery and utilization of associated gas from oil fields. This includes the installation of infrastructure to gather and transport the recovered gas to a transmission pipeline or a gas processing plant. Part of the recovered gas may be used to meet on-site energy demands. In the baseline scenario, the associated gas would be vented or flared. The project type reduces emissions by (i) displacing the use of fossil fuels and, where applicable, (ii) reducing venting of methane.

Applicability criteria

The methodology is applicable to project activities that recover and utilize associated gas[1] and/or gas-lift gas[2] that would be flared or vented in the absence of the project activity. "Recovery" is defined in the methodology as pre-treatment (i.e., compression and phase separation) of the associated/gas-lift gas in mobile or stationary equipment.

The following criteria apply for using the methodology:

- Under the project activity, the recovered gas may be transported to a processing plant where the recovered gas is processed into hydrocarbon products (e.g., dry gas, liquefied petroleum gas (LPG)), or may undergo basic pre-treatment to condition the gas.
- The dry natural gas should be either: (i) transported to a gas pipeline directly; or (ii) compressed to CNG first, then transported by trailers/trucks/carriers and then decompressed again. Thus, the methodology does not envisage on-site use of the recovered gas (e.g., power generation or heat generation) as the main recovery option. However, a partial amount of the associated gas and/or gas-lift gas can be used on-site to meet on-site energy demands, i.e., to run auxiliary equipment prior to the implementation of the project activity and after the implementation of the project activity.
- All recovered gas under the project activity should come from oil wells that are in operation and are producing oil at the time of the recovery.
- The methodology is only applicable if venting and/or flaring of the associated gas and/or gas-lift gas at the oil production facility is demonstrated to be the most plausible baseline scenario.

The project proponents should demonstrate that flaring or venting of the produced associated gas/gas-lift gas is the most plausible baseline scenario. This should be carried out by explaining why

[1] Associated gas is defined in the methodology as the natural gas found in association with oil, either dissolved in the oil or as a cap of free gas above the oil.

[2] Gas-lift is defined in the methodology as artificial lift method for oil wells exploitation in which gas is injected into the production tubing to reduce the hydrostatic pressure of the fluid column. The resulting reduction in bottomhole pressure allows the reservoir liquids to enter the wellbore at a higher flow rate.

other alternative scenarios, e.g., recovering the gas and use it as feed to a chemical plant, producing heat or electricity from the recovered gas, on-site use of the recovered gas, or simply implementing the project activity as a non-CDM project are not plausible.

Selection of emission sources for calculating emission reductions or removals

The recovered gas would be either flared or vented in the absence of the project activity. In both cases, emission reductions are only claimed from the displacement of fossil fuels due to the use of the recovered gas (the avoidance of venting is not accounted for). In calculating baseline emissions, only CO_2 emissions that would be emitted due to combustion of an equal amount of natural gas are considered. The methodology thus implicitly assumes that the recovered gas would displace methane, and not more carbon intensive fossil fuels.

The above provisions contribute to underestimating of baseline emissions, as discussed under sections UE1 and UE2 below.

Determination of baseline emissions

UE1 – Assumption that the use of the recovered gas displaces methane (and not more carbon intensive fossil fuels)

The methodology assumes that the recovered associated gas displaces other fossil fuel sources; nevertheless, it provides a simplified and conservative approach, assuming that the use of the recovered gas displaces the use of methane – the fossil fuel with the lowest direct CO_2 emissions. This provision contributes to underestimation of the baseline emissions, since any displaced fuel would have a higher carbon content than methane, and thus the baseline emissions would be higher than what is calculated by the methodology.

UE2 – Neglecting baseline methane emissions in case of venting

In cases where the associated gas would be vented in the baseline scenario, the methodology does not claim any avoidance of methane emissions. The rationale for this conservative approach is to avoid potential perverse incentives for project proponents to pursue venting prior to the implementation of a project, and to prevent that venting of gas is considered as a plausible business-as-usual scenario. Therefore, in the cases where all or part of the recovered gas would be vented in the absence of the project activity, the baseline emissions are underestimated. Note that this potential underestimation only applies to a very limited set of activities, where part or all of the recovered associated gas is vented under the baseline scenario.

UE3 – Neglecting methane slip from the baseline emissions

The methodology does not account for methane emissions in the baseline that are released to the atmosphere due to methane slip in flares[3]. This contributes to underestimation of baseline emissions.

OE1 – Lack of provisions to ensure that the amount of gas-lift gas produced under the project scenario is not higher than what would be produced in the baseline scenario

The methodology does not provide for safeguards to ensure that the amount of associated gas (and in particular gas-lift gas) produced under the project scenario is not beyond the amount that would

3 Methane slip is the quantity of un-combusted methane in the fuel gas of a flare due to a flare efficiency of less than 100%.

be produced under the baseline scenario. Specifically, the methodology does not require separate monitoring of the volume of gas that is sent to the gas-lift system. This could, in rare cases, lead to an excessive injection of gas to the gas-lift system, beyond the gas that would be injected to the gas-lift system in the absence of the project activity. Although the risk is likely to be small, the impact may result in overestimation of baseline emissions.

OE2 – Potential re-bound effects

The recovery of associated gas implies that additional gas is supplied to the market. This may, to some extent, lower gas prices. This may lead to a rebound effect and increased use of natural gas, which in turn could, in some cases, lead to increased emissions (depending on whether this leads to more fossil fuel use overall or whether increased natural gas displaces more carbon intensive fuels). The methodology does not account for this possible effect, which could lead to an overestimation of emissions reductions. The materiality of this overestimation varies depending on the market conditions, and the size of project as compared to the existing supply.

UE4 – No consideration of upstream emissions in the baseline scenario

The methodology assumes that the recovered gas would displace other fossil fuels. The methodology only accounts for the CO_2 emissions resulting from the combustion of these fossil fuels (conservatively assumed to be methane). However, upstream emissions associated with fossil fuel use in the baseline scenario (e.g., from oil and gas exploration or coal mining) are not considered under the baseline emissions. This contributes to an underestimation of baseline emissions.

Monitoring requirements

Baseline emissions are measured ex-post by measuring the actual recovered gas, which is assumed to be the amount that would be flared or vented in the absence of the project activity. The methodology has robust metering requirements and requires frequent analysis of the recovered gas, reducing the uncertainty of baseline emission calculations. The approach is robust and does not lead to material overestimation or underestimation of emission reductions.

Project emissions

The following sources of project emissions are accounted for in this methodology:

- CO_2 emissions due to consumption of fossil fuels for the recovery, pre-treatment, transportation, and, if applicable, compression of the recovered gas;
- CO_2 emissions due to the use of electricity for the recovery, pre-treatment, transportation, and, if applicable, compression of the recovered gas.

Several emission sources are not considered:

- Non-CO_2 emissions from the two sources above;
- Emissions from leaks, venting and flaring during the recovery, transportation and processing of recovered gas; and
- Emissions associated with construction of the project infrastructure.

The first and the third source are considered to be very small. The second source, i.e. emissions from leaks, venting and flaring during the recovery, transportation and processing of recovered gas is discussed further below as part of “Leakage”.

Project emissions from the consumption of fossil fuels

Project emissions due to the consumption of fossil fuels are calculated applying the “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”. This is generally appropriate and does not introduce significant uncertainty or over- or underestimation.

UE5 – Requirement to account recovered gas that is used under the project activity as project emissions

If part of the recovered gas is used under the project activity (for recovery, pre-treatment, transportation and compression of the recovered gas), the methodology requires that the CO_2 emissions from combustion of that part of the recovered gas be accounted as project emissions. These emissions would also occur in the baseline scenario where the same gas would be flared (or vented). The methodology, however, does not account for these baseline emissions. This leads to an underestimation of emission reductions.

Project emissions from consumption of electricity

Project emissions due to the use of electricity for the recovery, pre-treatment, transportation, and if applicable, compression of the recovered gas is calculated applying the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”. This is appropriate and does not introduce significant uncertainty or over- or underestimation

Determination of leakage emissions

Leakage emissions shall be accounted for project activities with the following circumstances:

- the recovered gas is transported to a processing plant where it is processed into hydrocarbon products (e.g., dry gas, LPG and condensates), and,
- the dry gas is compressed to CNG, and,
- the CNG is transported by trailers/trucks/carriers and then decompressed again, before it finally enters the gas pipeline.

OE3 – Neglecting fugitive emissions resulting from project implementation

The project infrastructure – e.g., flare/vent gas recovery equipment, compressors, transportation infrastructure, etc. – could contribute to fugitive emissions, in particular methane leaks. There is a greater potential for fugitive emissions for cases where the project activity comprises CNG transport and further decompression. Neglecting this element may lead to overestimation of emission reductions.

Summary and conclusion

Table 1 summarizes the results of the assessment and, where possible, presents the potential impact on the quantification of emission reductions for each of the previously discussed elements.

Table 1 Relevant elements of assessment and qualitative ratings

Element	Fraction of projects affected by this element[4]	Average degree of under- or overestimation where element materializes[5]	Variability among projects where element materializes[6]
Elements likely to contribute to overestimating emission reductions or removals			
OE1 – Lack of provisions to ensure that the amount of gas-lift gas produced under the project scenario is not higher than what would be produced in the baseline scenario	Low	Medium	High *(If it materializes, some project could be impacted to a higher degree)*
OE2 – Potential re-bound effects	Unknown	Low	High
OE3 – Neglecting fugitive emissions resulting from project implementation	All	Low	Medium
Elements likely to contribute to underestimating emission reductions or removals			
UE1 – Assumption that the use of the recovered gas displaces methane (and not more carbon intensive fossil fuels)	High	Medium	Medium *(The composition of the recovered gas is quite variable across the projects)*
UE2 – Neglecting baseline methane emissions in case of venting	Low *(Very few projects with venting apply this methodology)*	Medium *(Depending on what share of the recovered gas would otherwise be-vented, it could also be low or high)*	High

4 This parameter refers to the likely fraction of individual projects (applying the same methodology) that are affected by this element, considering the potential portfolio of projects. “Low” indicates that the element is estimated to be relevant for less than one third of the projects, “Medium” for one to two thirds of the projects, “High” for more than two third of the projects, and “All” for all of the projects. “Unknown” indicates that no information on the likely fraction of projects affected is available.

5 This parameter refers to the likely average degree / magnitude to which the element contributes to an over- or underestimation of the total emission reductions or removals for those projects for which this element materializes (i.e., the assessment shall not refer to average over- or underestimation resulting from all projects). “Low” indicates an estimated deviation of the calculated emission reductions or removals by less than 10% from the actual (unknown) emission reductions or removals, “Medium” refers to an estimated deviation of 10 to 30%, and high refers to an estimated deviation larger than 30%. “Unknown” indicates that it is likely that the element contributes to an over- or underestimation (e. g. overestimation of emission reductions in case of an omitted project emission source) but that no information is available on the degree / magnitude of over- or underestimation. Where relevant information is available, the degree of over- or underestimation resulting from the element may be expressed through a percentage range.

6 This refers to the variability with respect to the element among those projects for which the element materializes. “Low” means that the variability of the relevant element among the projects is at most ±10% based on a 95% confidence interval. For example, an emission factor may be estimated to vary between values from 18 and 22 among projects, with 20 being the mean value. “Medium” refers to a variability of at most ±30%, and “High” of more than ±30%.

UE3 – Neglecting methane-slip from baseline emissions	All	Low	High *(The baseline combustion efficiency of the flares could differ drastically among projects)*
UE4 – No consideration of upstream emissions in the baseline scenario	All	Low-Medium	High *(The leak detection & repair practices across fossil fuel value chains are very variable)*
UE5 – Requirement to account recovered gas that is used under the project activity as project emissions	Medium	Medium	Medium *(Most projects do use part of the flared gas for recovery of the APG, therefore variations are not high)*
Elements with unknown impact			
None	-	-	-

Three elements have been identified that could result in overestimation of emission reductions; however, their joint impact is likely to be low. Similarly, the fraction of projects that have the potential to be impacted by these overestimation elements is assessed to be rather low. On the other hand, a number of elements have been identified that could contribute to underestimation of emission reductions. Most of these elements have a medium to high likelihood of materializing, with a low-medium impact. For these reasons, the quantification methodology is assigned an overall score of 4.