



CDM: Form for submission of requests for deviation from methodology
(To be used by the DOE for requesting a deviation from methodology)

Name of the entity (DOE) submitting this form	DNV
Title of the project activity	Roxol Wastewater Treatment and Methane Gas Recovery Project
Title of methodology(ies)	ACM0014 ver. 3: Mitigation of greenhouse gas emissions from treatment of industrial wastewater
Title/subject of deviation	Cogeneration and allocation of emission reductions from biogas
Attach draft CDM-PDD of project activity	Yes, it is attached.
Date and signature for the DOE	2/3-12 Torje Folkestad

Please use the space below to describe the deviation and substantiate the reason for requesting a deviation from approved methodologies (validation/registration stage)

The requested deviation concerns the project titled Methane Recovery from Advanced Wastewater Treatment System in an Ethanol Plant that will take place in the Philippines.

The purpose of the project activity is to mitigate greenhouse gas (GHG) emissions by applying an anaerobic digester system at an ethanol plant (a greenfield facility). The proposed wastewater treatment system will recover the biogas generated from anaerobic digestion to produce steam and electricity using a cogeneration system. Biogas and other renewable sources of energy such as dry vinasse and bagasse will be fed to the cogeneration unit. As a conservative approach, only the portion of emission reductions associated with biogas use will be credited to this project activity.

The quantity of steam that will be generated from biogas is estimated to represent about 30% of the total energy produced from the boiler (ex-ante calculations presented by project proponent and reviewed by DOE).

Scenario 1 presented in the methodology ACM0014 version 4.1.0 applies to the proposed greenfield project, along with all other eligibility criteria listed (refer to PDD attached for details). As listed under scenario 1, the biogas extracted from the anaerobic digester will indeed be used to generate electricity and/or heat. The methodology is however not providing instructions for the monitoring of project emission where emission reductions are attributed only to one energy carrier (in this case biogas only, not bagasse nor dry vinasse).

Parameters listed in equations 15 and 18 of the methodology relate to the net quantity of electricity and heat generated only. In order to calculate the emission reductions attributed to only one energy carrier (biogas), as more than one energy carrier is used in the project case, a deviation is requested in the way this can be calculated. Accordingly, the fraction of heat and electricity generated attributed to biogas ($w_{biogas,y}$) shall be calculated based on the share of its energy content out of total energy content of all energy carriers as illustrated below:

Fraction of heat/electricity associated with biogas

$$w_{biogas,y} = \frac{(NCV_{biogas,boiler} * F_{biogas,boiler,y})}{[(NCV_{dry\ vinasse, boiler} * F_{dry\ vinasse, boiler,y}) + (NCV_{bagasse,boiler} * F_{bagasse,boiler,y}) + (NCV_{biogas, boiler} * F_{biogas,boiler,y})]}$$

w_{biogas} - Fraction of heat/electricity associated with biogas at the turbine

$NCV_{biogas\ boiler}$ - Net calorific value of biogas (kJ per volume or mass unit)

$NCV_{dry\ vinasse,boiler}$ - Net calorific value of dry vinasse (kJ per volume or mass unit)

$NCV_{bagasse,boiler}$ - Net calorific value of bagasse (kJ per volume or mass unit)

$F_{biogas,boiler,y}$ - Amount of biogas sent to boiler in year y (m^3/yr)

$F_{dry\ vinasse, boiler,y}$ - Amount of dry vinasse sent to boiler in year y (t/y)

$F_{bagasse,boiler,y}$ - Amount of bagasse sent to boiler in year y (t/y)

Emission reductions associated with electricity generation using biogas:

$$EGPJ,y = (w_{biogas,y} * Etot,y) - Econ, WWT,y$$

$EGPJ,y$ Net quantity of electricity generated in year y with biogas from the new anaerobic biodigester (MWh/y)

$Etot,y$ Electricity generated from the turbine in year y (MWh)

$Econ, WWT,y$ Electricity consumed for the wastewater treatment in year y (MWh)

Emission reductions associated with heat generation using biogas:

$$HGPI_y = w_{biogas,y} * [(F_{steam,y} * E_{steam,y}) - E_{feed\ water,y}] / 10E9$$

HGPI_y - Net quantity of heat generate in year y with biogas from the new anaerobic digester (TJ/y)

w_{biogas,y} - Fraction of heat/electricity associated with biogas at the turbine

F_{steam,y} - Quantity of steam generated from the boiler in year y (kg/y)

E_{steam,y} - Enthalpy of the steam generated by the boiler in year y (kJ/kg)

E_{feed water,y} - Heat content of the feed water entering boiler in year y (kJ/y)

$$E_{feed\ water,y} = F_{feed\ water,y} * T_{feed\ water,y} * 4.1868 \text{ kJ/kg C}$$

F_{feed water,y} - Quantity of feed water in year y (kg/y)

T_{feed water,y} - Temperature of feed water in year y (deg C)

This request for deviation of monitoring methodology is illustrated with the following calculations (ex-ante), based on 300 days of operation per year:

Table 1 - Please refer Annex 1

$$w_{biogas,y} = (24\,480 \text{ kJ/m}^3 * 34\,450 \text{ m}^3/\text{d} * 300 \text{ d/y}) / [(12,540 \text{ kJ/kg} * 62,400 \text{ kg/d} * 300 \text{ d/y}) + (7,500 \text{ kJ/kg} * 142,000$$

$$\text{kg/d} * 300 \text{ d/y}) + (24,480 \text{ kJ/m}^3 * 34,450 \text{ m}^3/\text{d} * 300 \text{ d/y})]$$

$$w_{biogas} = 0.3134$$

$$EGPI_y = (w_{biogas,y} * E_{tot,y}) - E_{con, WWT,y}$$

$$EGPI_y = [(0.3134 * 4\,000 \text{ kW} * 300 \text{ d/y} * 24 \text{ h/d}) - (240 \text{ kW} * 300 \text{ d/y} * 24 \text{ h/d})] / 1\,000$$

$$EGPI_y = 7\,298 \text{ MWh/y}$$

$$HGPI_y = [0.3134 * [(360\,000 \text{ kg/d} * 300 \text{ d/y}) * 3238.9 \text{ kJ/kg}] - [210\,000 \text{ kg/d} * 300 \text{ d/y} * 100 \text{ deg C} * 4.1868 \text{ kJ/kg C}]] / 10E9$$

$$HGPI_y = 83 \text{ TJ}$$

In order to apply the above mentioned methodology, additional parameters will be monitored and their monitoring points are illustrated in the diagram below (refer to Annex 4 of the PDD for detailed monitoring of all parameters, this is a simplified scheme)

Diagram 1 -Please refer Annex 1

Table 2- Please refer Annex 1

Please use the space below to describe and substantiate the assessment of the DOE that the deviation does not require an amendment to the approved methodology used by the proposed project activity.

The proposed deviation changes the procedure for measuring the net quantity of electricity generated in year y with biogas from the new anaerobic system (EGPI_y) and the net quantity of heat generated in year y with biogas from the

new anaerobic digester (HGPI_y) by introducing a new parameter w_{biogas,y} (the fraction of heat/electricity associated with biogas at the turbine).

The introduction of the parameter w_{biogas,y} will allow to calculate the emission reduction attributed only to biogas (and not bagasse nor dry vinasse).

As per the terms described in EB49 Annex 4, the project participants deviate from AM00014 version 4.1.0, when applying the methodology to the proposed project activity and the DOE considers that the deviation is due to the proposed project specific situation, and not applicable for other projects applying AM00014 version 4.1.0, implying a revision of the methodology would not be required to address the issue.

Please use the space below to describe the impact of the deviation on the estimates of the emissions reductions for the proposed project activity with the use of approved methodology as existing and with the deviation. Please substantiate the estimations with relevant and verifiable data.

There is no impact on emission reduction as the consideration of the emission reductions attributed to the biogas from a mix of renewable resources used in the cogeneration unit is considered to be conservative. The inclusion of the fraction factor w_{biogas,y} will ensure that only the portion of emission reductions associated with biogas use will be credited to this project activity.

Link to the documentation made available at validation stage
https://cdm.unfccc.int/Projects/Validation/DB/TEDQ47YBGWZDX6UNSNQCIE1JUVVWA/view
If necessary, list attached public files containing relevant information which is not available through the above link
02-Mar-2012 Annex 1 02-Mar-2012 Annex 2 (confidential) 02-Mar-2012 Annex 3 (confidential)

