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Validation opinion

Request for revision of monitoring plan for project activity 0496 entitled "Avoidance of Wastewater and On-site Energy Use Emissions and Renewable Energy Generation in IFB Agro Distillery unit"

We refer to the procedure for revising monitoring plans adopted at EB 26 (Annex-34) which allows for the project participants to revise the monitoring plans in order to improve accuracy and/or completeness of information.

We herewith request a revision of the monitoring plan for project activity 0496 entitled "Avoidance of Wastewater and On-site Energy Use Emissions and Renewable Energy Generation in IFB Agro Distillery unit" in India.

The project activity involves treatment of the spent wash of the distillery unit of IFB Agro industries in Noorpur, India in a newly installed bio-digester and increase in the efficiency of an existing low efficiency bio-digester. The technology uses anaerobic method of treating wastewater with high suspended solid organic content, resulting in methane generation. The system is designed to capture the methane generated and use it as fuel for heat and power generation. The project also avoids methane emissions from the anaerobic treatment of the semi-treated effluent from the bio-digester in open lagoons by introducing an aerobic system consisting of an evaporator and a spray-drying system. The bio-solid thus generated will be fired in the boilers along with the bio-gas. Rice husk will be used as supplementary fuel. The project activity hence results in the reduction of GHG emission by

(i) increasing the amount of methane collected from the digester system by increasing the efficiency of the existing system and introducing a new digester,
(ii) avoiding the release of methane from open lagoons into the atmosphere by replacing the lagoon system with spray drying unit,
(iii) avoiding CO_2 emissions due to furnace oil consumption for steam generation and
(iv) displacing electricity from the eastern regional electrical grid.

The project applies the approved small-scale methodologies AMS-III.D, version 8 for methane recovery efficiency improvement in the existing bio-digester, AMS-III.H, version 1 for the introduction of new bio-digester to the existing anaerobic treatment system, AMS-III.I, version 1 for the replacement of the anaerobic lagoon system with spray drying unit and AMS-I.C, version 8 for thermal energy for the user. The project is within the eligibility requirements of the baseline methodologies since the project emissions are only 5 Kt CO_2e per annum and the total installed

capacity is only 11 $MW_{thermal}$ both of which are below the stipulated 15 Kt CO_2e per annum and 45 $MW_{thermal}$.

The monitoring plan in the registered PDD contained certain parameters which were only used for ex-ante estimation of the emissions and will not be required for calculating the emission reductions ex-post. Also several parameters which are required to be monitored as per the methodologies used had not been included in the monitoring plan of the registered PDD. The monitoring procedures for some other parameters were not elaborate or accurate enough to provide a real estimate of the baseline emissions as well as the project emissions.

As per the proposed monitoring plan, the following revisions are proposed in the monitoring plan of the registered PDD and the following parameters (with the IDs) will be monitored to ensure the completeness of the monitoring:

ID No.	Data type	Data variable	Data Unit	Measured (M), Calculated (C),Estimated (E)	Frequency of reporting	Comment**
Data requirement as per original monitoring plan.						
1	Volume	Wastewater flows entering system (digesters, lagoons) boundary at project scenario	m^3	M	Continuously	The effluent inflow will be monitored by cumulative volumetric flow measuring meters **(Except EVP inlet flow which has been retained in the revised monitoring plan as ID No. 6, this parameter has been removed for all other waste water flows entering system in the revised monitoring plan as it was used for ex-ante estimation of emission reduction and not used for ex-post calculation as per methodology applied)**
2	Volume	Wastewater flows leaving project (digesters, lagoons) treatment facility at project scenario	m3	M	Continuously	- do- **(The parameter has been removed in the revised monitoring plan as it was used for ex-ante estimation of emission reduction and not used for ex-post calculation as per methodology applied)**
3	Concentration	Chemical oxygen demand of the effluent entering the project boundary at project scenario	kg COD/m3	M	Daily	Daily analysis of sample is conducted at in-house lab and observations are recorded. **(Except EVP inlet flow which has been retained in the revised monitoring plan as ID No. 5, this parameter has been removed for all other effluent entering system in the revised monitoring plan as verification is based on actual amount of gas generated and utilized within the project boundary as per AMS-III.H and AMS-III.D)**
4	Concentration	Chemical oxygen demand of the effluent leaving the project boundary at project scenario	kg COD/m3	M	Daily	-do- **(Removed in the revised monitoring plan as verification is based on actual amount of gas**

** **All data related to project parameter will be archived for 10+2 years.**

ID No.	Data type	Data variable	Data Unit	Measured (M), Calculated (C),Estimated (E)	Frequency of reporting	Comment**
						generated and utilized within the project boundary)
5	Volume	Volume of biogas sent to the boilers	Nm3	M	Continuously	Cumulative volumetric flow meter is installed to record the total biogas send with account of pressure and temperature correction. **(Retained in the revised monitoring plan as data ID number 1)**
6	Mass	Quantity of rice husk used as supplementary fuel along with bio-solid	MT	M	Daily	Separate log sheet will be maintained and this can be crossed checked with invoices raised for payment and opening and closing stocks on annual basis**. (Retained in the revised monitoring plan as data ID number 14)**
7	Mass	Bio-solids	MT	M	Daily	Separate log sheet will be maintained both at generation (incineration cum spray drying unit) and user end (boiler) (**Retained in the revised monitoring plan as ID numbers 7, 9 and 15)**
8	Mass	Total steam generated at the project by firing biogas, bio-solids, rice husk	MT	M	Daily	Separate log sheet will be maintained, **(Retained in the revised monitoring plan. For more accurate determination the steam generated is monitored individually for each boiler. The data is presented under ID number 17)**
9	Temperature	Temperature characteristics at individual steam out of the boilers within the project boundary	^{o}C	M	Annual	**(This parameter has been revised in the revised monitoring plan. Steam chart will be used based on the measured steam pressure of the saturated process steam going to the process through common header. The data is presented under ID number 18. This parameter has no direct implication for CER calculation.)**
10	Pressure	Pressure characteristics of individual boilers within the project boundary	Kg/cm2	M	Annual	**(The parameter has been removed from the revised monitoring plant. Instead for more accurate process steam enthalpy calculation, the saturated process steam pressure at the consumption end of Process plant will be monitored. The data is**

ID No.	Data type	Data variable	Data Unit	Measured (M), Calculated (C),Estimated (E)	Frequency of reporting	Comment**
						presented under ID numbers 19)
11	Electricity	Generation of electricity by the project	kWh	M	Continuously	Electricity meter (**Retained in the revised monitoring plan. For more accurate determination of emission reduction the gross power from each individual power generation equipment is presented under ID number 10**)
12	Electricity	Grid electricity consumed by project	kWh	E	Annual	This will be estimated based on electricity mix (gird and captive generation) consumed by the unit. (**Excluded in the revised monitoring plan as the project emission associated with power consumed by drives installed as a part of project is calculated based on grid emission factor only for conservativeness)**
13	Power	Total auxiliary power consumption by the ETP plant	kWh	C	Annual	The total power load of the ETP unit will be estimated based in number of electrical equipments installed and their load capacity. **(Retained in the revised monitoring plan as ID number 28, 29 & 30. ID number 11 is for monitoring of total auxiliary power by the new boiler and power units within the project boundary.)**
14	Hours	Total operating hours of the auxiliary power units of the ETP plant	hours	M	Daily	At time when there will be stoppage any electric motor/ unit, its downtime will be recorded. As per operating procedure ETP unit is operated for 24 hours. Subtracting any downtime will provided actual run time hours. (**Removed in the revised monitoring plan as verification is based on 24 hours per day and 365 days / annum considering conservativeness.)**
15	Grid Emission Factor	Emission factor of the Eastern Regional grid	tCO2/GWh	E	Once during the PDD	This conservative as the emission factor of the grid in the future is likely to increase based BM calculation.

ID No.	Data type	Data variable	Data Unit	Measured (M), Calculated (C),Estimated (E)	Frequency of reporting	Comment**
					preparation	**(Removed from the revised monitoring plan since this is ex-ante calculated and mentioned in the registered PDD and the validation report as 1108 tCO2e/GWh.)**

Data to be monitored as per revised monitoring plan :

Data to be monitored for methane capture and avoidance in boiler system.						
1	Volume	Biogas flow to Boiler #1, Boiler #2 & Boiler #3	Nm3	Measured	Daily	Daily data will be monitored and monthly cumulative data will be compiled.
2	Percentage	Methane content of biogas going to Boilers	% by volume	Measured	Daily	Will be measured on daily basis in in-house lab.
3	Mass	Sludge removed from Digester #1 & Digester #2	Tonnes	Measured	Yearly	A separate log will be maintained on amount of sludge generated (dry basis) and end use of the sludge.
4	Density	Density of Methane	Kg/ NM3	Estimated	Once during project period	Will be taken from technical literature

The above mentioned parameters (1-4) are required to be monitored as per the methodologies AMS-III.H, version 1 and AMS-III.D, version 8

Data to be monitored for methane avoidance due to evaporator, spare dryer system.						
5	Concentration	Inlet COD of waste water to evaporator / spray dryer system	Kg /M3	Measured	Daily	Will be monitored on daily basis in in-house lab.

ID No.	Data type	Data variable	Data Unit	Measured (M), Calculated (C),Estimated (E)	Frequency of reporting	Comment**
6	Volume	Inlet flow of waste water to evaporator/spray dryer system	M3	Measured	Daily	Will be measured by cumulative meter.
7	Mass	Bio-solid generated	Tonnes	Measured	Daily	Will be measured on daily basis.
8	Mass	Steam consumed in evaporator system	Tonnes	Measured / Estimated	Daily	Will be measured at consumption end / estimated based on the design value of steam consumed per m 3 of influent to the evaporator system in absence of flow meter.
9	Bio-solid end use	Bio-solid end use		Measured	Annually	Bio-solid end use will be monitored regularly as per the methodology

The above mentioned parameters (5-9) are required to be monitored as per methodology AMS-III.I, version 1

Data to be monitored for electricity generated from renewable sources						
10	Power	Gross power generated from IG, TG#1, TG#2 and TG#3	Kwh	Measured	Monthly	Will be measured on daily basis and accumulated to compute the monthly figure
11	Power	Auxiliary power consumed by Boilers and Turbine systems	Kwh	Measured / calculated	Monthly	Will be measured from installed kWh meter or will be calculated based on rated power of the drives installed in the Boiler -Turbine plant & the daily operating hours of the drives where there is no kWh meter.
12	Power	Net amount of power generated from the project plant	Mwh	Calculated	Monthly	It is calculated as function of gross power generated and auxiliary power consumed in the boiler and turbine system.
Data to be monitored for FO substitution with biogas and renewable biomass						

ID No.	Data type	Data variable	Data Unit	Measured (M), Calculated (C),Estimated (E)	Frequency of reporting	Comment**
13	Percentage	Boiler efficiency of Boiler #1, Boiler #2 and Boiler #3	%	Calculated	Yearly	Will be calculated based on relevant parameters measured on an annual frequency by external third party. The highest efficient boilers efficiency will be considered conservatively for input enthalpy calculation.
14	Mass	Mass of rice husk fired in Boiler #2 and Boiler #3	Tonnes	Measured	Daily	Will be measured on wet basis
15	Mass	Mass of bio-solid fired in Boiler #3	Tonnes	Measured	Daily	
16	Volume	Amount of biogas fired in boiler1 prior to project implementation	Nm3/day	Measured	Once before PDD preparation	This is fixed for the entire project period on the basis of historical consumption data
17	Mass	Amount of steam supplied to process from Boiler #1, Boiler #2 and Boiler #3	Tonnes	Measured	Daily	Will be measured by cumulative meter at Boiler out let.
18	Temperature	Temperature of process steam consumed being generated from Boiler #1, 2 &3	Deg C	Estimated	Daily	Will be taken from Steam table for saturated steam against measured steam pressure.
19	Pressure	Pressure of process steam consumed being generated from Boiler #1, 2 &3	Kg/ cm2	Measured	Daily	Gauge pressure. Will be measured at the consumption end of process plant.
20	NCV	Net calorific value of methane	Kcal/kg	Estimated	Once during project period	Since local data is not available the data will be taken from publicly available technical literature.

The above mentioned parameters (10-20) will be required to be monitored for calculating baseline emissions as per AMS-I.C, version 8

ID No.	Data type	Data variable	Data Unit	Measured (M), Calculated (C),Estimated (E)	Frequency of reporting	Comment**
Data to be monitored for calculation of project emission:						
21	Mass	Amount of charcoal consumed for spray dryer system and boilers	Tonne	Measured	Monthly	Will be taken from the weighbridge records and what ever is procured will be accounted as project emissions. This is deemed conservative.
22	NCV	NCV of charcoal used	TJ / '000 MT	Estimated	Once during Project period	Since local value is not available, IPCC default values will be used.
23	Carbon content	Carbon content of charcoal consumed in the boiler system and evaporator.	TC/TJ	Estimated	Once during Project period	Since local value is not available, IPCC default values will be used.
24	Volume	Amount of FO co-fired in Boiler#1	KL	Measured	Daily	Will be measured from dip stick measurement of calibrated FO tank
25	Density	Density of FO consumed in the boiler system	Kg/ liter	Estimated	As and when procurement is done	Will be taken either from suppliers or as per test results from in-house lab.
26	Carbon content	Carbon content of FO consumed in the boiler system	TC/TJ	Estimated	Once during Project period	Since local data is not available IPCC default value will be used.
27	NCV	Net calorific value of FO	TJ/ '000 MT	Estimated	Once during project period	Since local data is not available IPCC default value will be used.
28	Power	Baseline amount of power consumed by the waste water plant prior to project	Kwh	Estimated	Once before PDD preparation	Will be estimated based on rated power of the drives involved and annual operating hours, considering 24 Hrs. 365 days conservatively.

ID No.	Data type	Data variable	Data Unit	Measured (M), Calculated (C),Estimated (E)	Frequency of reporting	Comment**
29	Power	Amount of power consumed by the waste water plant post project implementation	Kwh	Estimated	Monthly	Will be estimated based on rated power of the drives installed in the waste water plant and the annual operating hours of the drives. Hours, considering 24 Hrs. 365 days conservatively.
30	Power	Amount of power consumed by EVP and spray drier in project scenario	Kwh	Measured	Monthly	Will be measured by energy meter.

The above mentioned parameters (21-30) will be monitored for calculating project emissions

Data to be monitored for Leakage calculation due to Bio mass transportation:						
31	Mass	Amount of biomass purchased	Tonnes	Measured	Monthly	Will be taken from procurement figures and on wet basis.
32	Mileage	Average mileage of vehicles used for biomass transport	Km / liter	Estimated	Once during project period.	Since local data is not available publicly available literature data will be used.
33	No. Of trips	No. Of trips	No. of trips	Estimated	Once a year	Will be estimated based on Biomass purchase invoice records
34	Distance	Distance from which biomass material is being procured	Km	Estimated	Once a year	Will be taken from reference maps and major sources of procurement during the year. Out of the all sources maximum distance will be considered in the leakage calculation for both way travel.

The above mentioned parameters will be monitored for calculating leakage emissions from transportation of biomass

The proposed revision of the monitoring plan is in accordance with the approved monitoring methodologies applicable to the project activity and is complete in terms of details and accuracy of measurement.

The proposed revision of the monitoring plan is in accordance with the approved monitoring methodology of AMS III.D, version 8 and AMS-III.H, version I, which states that the amount of methane recovered and fuelled or flared shall be monitored ex-post through continuous flow meters and periodic measurement of methane content of the combusted gas. Temperature and pressure of the gas are required to determine the density of the methane combusted. Also the amount of sludge disposed and end-use of final sludge is to be monitored. All these parameters have been addressed in the revised monitoring plan through parameters 1 to 4.

The proposed revision of the monitoring plan is also in accordance with the approved monitoring methodology of AMS III.I, version 1 which states that "*the amount of COD treated in the wastewater treatment plant shall be measured regularly. The wastewater flow shall be recorded. 9. The yearly amount of sludge produced (Sy) shall be directly measured by weight or indirectly by its volume and density. Its degradable organic content (DOCy,s) will be measured by representative sampling and analysis, in case the default value is not used."* These parameters have been addressed in the revised monitoring plan through parameters 5 to 9. Since the default DOCy value will be used this parameter is not required to be monitored.

Also as per AMS-I.C, version 8, the thermal energy and electrical energy generated is to be measured as well as the amount of fossil fuel input. The electrical energy generated will be monitored through parameters 10-12 of the revised monitoring plan. The thermal energy generated will be monitored through parameters 13-20. Since the project involves displacement of furnace oil for process steam generation, the process steam enthalpy and not the generated steam enthalpy has been monitored as conservative approach. The amount of other fossil fuels co-fired with rice-husk and methane as well as any excess energy consumption due to the project has been monitored through parameters 21-30 of the revised monitoring plan.

As per procedures of calculating leakage due to emissions from biomass transport, the amount of biomass procured, the mileage of trucks, the number of trips involved and the maximum distance of the biomass source from the plant will be monitored through parameters 31-34.

Validation Opinion

Hence it is DNVs opinion that:

a. The proposed revision of the monitoring plan ensures completeness in the monitoring and verification process and the level of accuracy is not reduced as a result of the revisions. Rather the accuracy and completeness of the monitoring plan is increased.
b. The proposed revision of the monitoring plan is in accordance with the approved monitoring methodology applicable to the project activity
c. The parameters proposed to be monitored are adequate and necessary to estimate the emission reduction during the crediting period.

DNV hence request the acceptance of the proposed revision to the monitoring plan of the registered project activity 0496 entitled "Avoidance of Wastewater and On-site Energy Use Emissions and Renewable Energy Generation in IFB Agro Distillery unit"

Yours faithfully
for DET NORSKE VERITAS CERTIFICATION AS

Michael Lehmann
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