CDM: Proposed new methodology expert form (version 03)

(To be used by methodology experts providing desk review for a proposed new methodology)

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Note to those completing this form, as applicable: Please provide recommendations on the proposed new baseline and monitoring methodologies based on an assessment of annexes 3 and 4 and of their application in sections A to E of the draft CDM PDD, desk reviews and public input. Please ensure that the form is entirely filled and that arguments and expert judgements are substantiated.

A. Evaluation of the proposed new methodologies by desk reviewers:

I. Evaluation of the proposed new baseline methodology:

Title of new baseline methodology:>>Natural gas-fired cogeneration plant replacing oil-fired boilers

i. Conditions under which this methodology is applicable to other potential projects (e.g. project type, region, data availability):

>>Project type:

As far as natural gas is available, this methodology is applicable to any cogeneration plant and electric power generating plant basically with the necessary modification of the monitoring methodology to be appropriate for the plant system and operation. The types of project to which this methodology is applicable are as follows,

(1) Replacement of boiler with natural gas-fired cogeneration plant with and without gas turbine which supplies process steam and electric power to the associated process.

(1.1) Related to item (1); the electric power generated is supplied to the process and electric grid.

(1.2) Related to item (1); the process steam is extracted from the steam turbine of the bottoming plant or the exhaust heat recovery boiler.

(2) Electricity is generated by combined cycle plant or simple cycle plant such as gas turbine and gas engine, and process steam is produced by heat recovery boiler or extracted from the steam turbine of the bottoming cycle.

(3) In case that process steam is not required, it is applicable to the replacement with natural gas-fired combined cycle plant, simple cycle plant and gas engine plant.

Technological barriers required for CDM: Such barriers as the follows exist,

(1) Replacement with natural gas-fired plant is inferior to oil-fired boiler with electric power supply from electric grid in economy because of lower price of oil fuel and the existing boiler works without renovation/modification for longer period than the credited period.

(2) Combined cycle cogeneration plant is quite new technology for the region and accompanies operational risks.

Data availability:

(1) Such data as the quantity of required process steam and electric power for the quantity of products are available.

ii. Strengths and weaknesses of the methodology:

>>Strengths of the methodology:

(1) Fuel change from oil to natural gas reduces global warming gas such as CO2 and air pollution substances to the atmosphere remarkably.

(2) Replacement of oil-fired boiler with cogeneration plant reduces fuel consumption remarkably

because that process steam is generated by exhaust heat recovery boiler.

(3) Change of the electric power supply from electric grid to that from gas turbine combined cycle plant reduces fuel consumption remarkably in case that the electric power of the grid is not generated with natural gas-fired combined cycle plant because that natural gas-fired combined cycle has much higher electric power generation efficiency than other electric power generation systems. Weaknesses of the methodology from the viewpoint of CDM:

(1) The price of natural gas, especially LNG is higher than oil. Therefore the application of the methodology to CDM is limited to the regions where the price of oil is higher than natural gas, which causes the replacement with a system which uses natural gas less economical.

iii. Any changes needed to improve the methodology:

a. Minor changes:>>None

b. Major changes: >>None

II. Evaluation of the proposed new monitoring methodology:

Title of new monitoring methodology: >> ˆ Natural gas -fired cogeneration system replacing oil-fired boiler

i. Conditions under which this methodology is applicable to other potential projects (e.g. project type, region, data availability):

>>Project type:

The methodology is applicable to any gas turbine cogeneration plant. Depending on the modification, the applicable range of the monitoring methodology is widened. Under the following conditions, required modification is minimum.

(1) Process steam is generated by heat recovery boiler and it is extracted from the boiler or the steam turbine of the bottoming plant.

(2) Electric power for the process is generated and supplied by the natural gas-fired cogeneration plant

(3) Replacement of oil-fired boiler with natural gas-fired combined cycle plant or simple cycle plant in case that process steam is not required.

Data availability:

(1) The relation between the quantities of the products and the consumption of the process steam/electric power is known. In case that it is not known, the consumptions shall be measured.

ii. Strengths and weaknesses of the methodology:

>> Strength of the methodology:

(1) The parameters such as the consumption of natural gas, the quantity of electric power supplied to process and grid, and the production quantity of the plant are measurable with high accuracy, which results in accurate estimation of global warming gas emissions.

(2) The key items to be measured are few.

(3) The calculation of the quantity of global warming gases is simple and transparent.

(4) The methodology is applicable to a variety of project type as described above.

Weaknesses of the methodology:

(1) As the plant system is complicated because of gas turbine combined cogeneration plant, the estimation of the quantity of global warming gas emissions at the design stage or for PDD requires complicated performance calculation, though it is simple to monitor when the plant is in operation.

(2) High accurate measurement of volume flow such as natural gas consumption and steam consumption requires high accurate measuring device and collections for the operating conditions.

(3) In case that the relation between the quantity of the products and the quantity of process steam/electric power is not known, measurement of the quantity and the quality of process steam is required.

iii. Any changes needed to improve the methodology:

a. Minor changes:>> The quantity of process steam is calculated with the quantity of products more accurately by applying the relation which is measured of the oil-fired boiler beforehand. The estimation and the comparison of global warming gas emissions shall be conducted for the same quantity of products.

b. Major changes: >> The calculation of global warming gas emissions shall be calculated for the quantity of natural gas which is introduced to gas turbine and measured at the inlet instead of the calculated natural gas quantities for producing process steam and for electric power generation from the viewpoints of higher accuracy and transparency.

B. Details of the evaluation of the proposed new methodology by the desk reviewer:

I. Proposed new baseline methodology *(specify title here):* >>Natural gas-fired cogeneration system replacing oil-fired boilers

(1) Short description of the methodology, including an assessment of which approach from paragraph 48 of the CDM modalities and procedures was used:

a) Describe the methodology:

>>The methodology of the proposed project activity is to reduce global warming gas emissions by replacing existing oil-fired boiler with electric power supply from electric grid with gas turbine combined cycle cogeneration plant. Baseline is "Existing actual or historical emissions".

b) State the approach selected:

>>(1) Fuel switch: Fuel switching from oil to natural gas reduces global warming emissions remarkably.

(2) Application of combined cycle: The electric power generating efficiency of combined cycle is much higher than simple cycle resulting in less fuel consumption.

(3) Application of cogeneration: The energy efficiency of cogeneration plant in which process steam is produced by exhaust heat recovery boiler is almost as high as oil-fired boiler and higher than combined cycle resulting in less fuel consumption.

c) Indicate (in summary form) why the approach selected is the most appropriate. Please provide your expert judgement on the appropriateness of the selected approach to the project category:

>>(1) Fuel switch: Natural gas produces much less global warming gas emissions and the most suitable fuel for gas turbine combined cycle plant.

(2) Application of combined cycle: As for electric power generating plant, gas turbine combined cycle plant gives the highest power generating efficiency resulting in the least fuel consumption for power generation.

(3) Application of cogeneration: Cogeneration is the most efficient method for fuel saving because that exhaust heat is recovered and effectively used for process steam production.

Therefore combined cogeneration plant gives the most effective means for supplying process steam and electric power.

(2) Basis for determining the baseline scenario:

a) State whether the documentation explains how the baseline scenario is to be chosen and identified:

>>The documentation explains that as the existing method in which process steam is produced with the existing oil-fired boiler and electric power is supplied from electric grid is most cost-effective. Therefore the existing method with oil-fired boiler is chosen as the baseline scenario.

b) State the basic underlying rationale for algorithms/formulae used (e.g. marginal vs. average basis) (see also section 4 below):

>>As the emissions from the baseline scenario are those from the oil burnt in oil-fired boiler and those from the natural gas burnt to generate electric power, the total emissions of the baseline is the sum of both emissions. Based on this fact, algorithms/formulae are composed. Each global warming gas emissions are estimated based on fuel oil consumption of oil-fired boiler and natural gas consumption which is calculated with estimated average heat rate of the plants connected to the electric grid.

c) State whether the documentation explains how, through the use of the methodology, it can be demonstrated that a project activity is additional and therefore not the baseline scenario. If so, what are the tools provided by the project participants?

>>Though the most cost-effective method is the existing method in which process steam is supplied by oil-fired boiler and the electric power by electric grid, the project participants adopt gas turbine combined cycle cogeneration which produces least global warming gas emissions.

d) State whether the basis for determining the baseline scenario and for assessing additionality is appropriate and adequate:

>>The basis for determining the baseline scenario and for assessing additionality is basically appropriate and adequate.

Though the details are not described, various schemes including cogeneration utilizing oil-fired boilers and cogeneration utilizing gas turbine in addition to the schemes of keeping use of the existing oil-fired boiler and cogeneration with gas turbine combined cycle, the proposed project scheme. Though the scheme of using existing oil-fired boiler was of the least cost and the scheme of cogeneration utilizing gas turbine combined cycle requires more investment, the latter was adopted due to the environmental benefits and fuel saving.

(3) Assessment of the description of the proposed methodology and its applicability

a) State whether the methodology has been described in an adequate manner:

>>It is described in adequate manner in general.

b) State whether the proposed methodology is appropriate for the referred proposed project activity and the referred project context (described in Sections A-E of the draft CDM-PDD and submitted along with Annex 3):

>>It is appropriate for the referred proposed project activity and the project context.

c) State whether the application of the methodology could result in a baseline scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity.

>>The application of the methodology to use existing oil-fired boiler for supplying process steam and to purchase electric power from electric grid could result in baseline scenario because that it is most cost effective and reasonably represents the global warming gas emissions.

Please explain:

>>As the price of oil fuel is less expensive than natural gas and the existing oil-fired boiler will work longer than the crediting period, the scheme to use the existing boiler and to purchase electric power from grid is most cost-effective.

(4) Assessment of algorithms/formulae and type of data needed:

a) State whether the description of the methodology includes algorithms and generic formulae that can be applied to other potential project activities (if not, the proposed new methodology will be considered as a project-specific methodology):

>>The description of the methodology includes algorithms and generic formulae that can be applied to other potential project activities such as gas turbine cogeneration plant, gas turbine combined cycle plant, gas turbine plant, gas engine and gas engine cogeneration plant.

b) Explain the spatial scope of data used to determine the baseline and whether the scope is appropriate:

>>The spatial scope to determine the baseline which is limited to the plant site where oil-fired boiler is located is appropriate.

c) Explain the vintage of data used (in relation to the duration of the project crediting period) and whether the vintage of data is appropriate, indicating the period covered by the data:

>>The vintage of the operating data from 2000 to 2001 year before the commencement of operation of the proposed project in 2003 year are used for determining the baseline emissions. The data are appropriate for estimating the global warming gas emissions of the baseline.

(5) Definition of the project boundary related to the baseline methodology:

a) State how the project boundary is defined in terms of:

i) Gases and sources

>>It is determined as the corn processing plant site where oil-fired boiler which emits various harmful gases including global warming gases to the atmosphere is located. As the emission of CH4 and N2O are of negligibly small amount, CO2 emission is taken into consideration for the calculation of global warming gas emissions of the baseline.

ii) Physical delineation

>>The physical boundary is defined as the site where oil-fired boiler which produces the process steam is located.

b) Indicate whether this project boundary is appropriate:

>>The project boundary is appropriate. Though global warming gas emissions accompany with the production and transmission of oil, the quantities are negligibly small compared with the oil-fired boiler

(6) Key assumptions/parameters (including emission factors and activity levels) and data sources:

a) List the implicit and explicit key assumptions. Identify those, if any, which are problematic and explain:

>> .

b) State whether the key assumptions are arrived at in a transparent manner:

>> They are arrived at in a transparent manner basically, though the accuracy of the estimation of the emissions is somewhat sacrificed.

c) Give your expert judgement on whether the assumptions/parameters are adequate:

>>They are not adequate from the view point of accurate estimation of global warming gas emissions, but acceptable from the practical view point.

As it is essentially difficult to calculate the consumption of energy for steam production and electricity generation separately, global warming gas emissions shall be calculated based on the natural gas quantity consumed by the gas turbine based on the heat balance (performance calculation of the plant) for PDD and based on the measurement for monitoring.

As the relation between the energy consumption or the steam production and the quantity of products of the

baseline scenario (oil-fired boiler) is not the same as the proposed scenario (cogeneration plant), the quantity of natural gas consumption may not be assumed simply as proportional to the quantity of the processed corn. The same can be said of the calculation of the quantity of natural gas consumption for the electricity generation. The similarity of the steam consumption and the electric power consumption shall preferably be proven by the measured data of the proposed project.

d) Indicate which data sources are used and how the data are obtained (e.g. official statistics, expert judgement):

>>Data related with oil and electric energy consumption of the baseline scenario are supplied by Corn Products Brazil: As for the fuel analysis data such as energy content (energy value) of fuel and fuel composition, they shall be issued by an authorized third party preferably and as for electric energy consumption, the data shall be issued by the electric power supply company preferably.

Carbon factors of oil and natural gas are taken from "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 3, OECD/IEA": They shall be calculated based on the fuel composition analyzed of the fuel actually used for better accuracy preferably. But it is acceptable to rely on IPCC data from the practical view point.

Electric grid efficiency used for the baseline fuel consumption is taken from Gas Turbine Handbook for natural gas-fired units purchased for the Brazilian market during 2000to 2001 and the heat rate assumption were supplied by the manufacturers: Electricity generating efficiency of grid shall be issued by the power company of the electric grid instead of deriving from Gas Turbine Handbook, though there may not be much difference between them from the practical viewpoint.

Heat rate assumption is supplied by the manufacturer: It is reasonable for PDD which is prepared at the planning stage before the plant commences operation.

Onsite efficiency of 12,000 Btu/kWh (typical efficiency of new on-site diesel generation unit) is used: It is not clear for what and how it is used for the estimation of global warming gas emissions from the project. The expected efficiencies shall be given by the manufacturer of the facility at the planning stage. The formula for the calculation of the fuel consumptions shall be clearly shown.

e) Give your expert judgement on whether the data used are adequate, consistent, accurate and reliable:

>>As commented in the above, the data used are not accurate scientific viewpoint and it is not clear how the figures are used for the calculation of the global warming gas emissions. They shall be shown in the formula how they are used for the calculation.

f) State possible data gaps:

>>As commented in the above, the data used are not accurate from scientific viewpoint and it is not clear how the figures are used for the calculation of the global warming gas emissions. They shall be shown in the formula how they are used for the calculation.

(7) Assessment of uncertainties:

a) State whether the methodology includes an assessment of uncertainties regarding:

i) The basis for determining the baseline scenario:

>>Not adequate.

ii) Algorithms/formulae:

>>Not adequate.

iii) Key assumptions:

>>Not adequate.

iv) Data:

>>Not adequate.

b) State whether the uncertainties presented are reasonable:

>>Uncertainties are not assessed adequately.

(8) Leakage:

a) State how the baseline methodology addresses any potential leakage due to the project activity:

>>It addresses the potential leakage of natural gas during the transmission and distribution to the project site and during combustion activities at the plant site.

b) Indicate whether the treatment for leakage is appropriate and adequate:

>>The quantity of the leakage is small, so it is neglected for the calculation of global warming gas emissions.

(9) Transparency and "conservativeness":

a) Indicate whether the baseline methodology was developed in a transparent way:

>>It was developed in a transparent way basically except that some important data such as grid electric power generating efficiency which was assumed and the heating value and composition of the fuel oil which were supplied by the participant in place of the authorized third party.

b) State whether the baseline methodology is conservative:

>>It is not clear whether it is conservative or not because of the reasons described above, though it is stated that the global warming gas emissions caused by the power transmission loss and the transportation of fuel are not included in the calculation of the global warming gas emissions of the baseline.

(10) Potential strengths and weaknesses of the proposed baseline methodology *(please explain)***:**

>>Potential strengths:

Oil is less expensive than natural gas.

Existing oil-fired boiler is usable for longer than crediting period without Natural gas produces much less global warming gases than oil.

Potential weaknesses:

Oil fuel produces more global warming gases and other harmful substances such as SOx, NOx and others than natural gas.

The energy efficiency of using existing oil-fired boiler and purchasing electric power from electric grid is much lower than the gas turbine combined cycle cogeneration.

(11) Other considerations, such as a description of how national and/or sectoral policies and circumstances have been taken into account *(please explain)***:**

>>The government of Brazil has a plan to increase thermal power generating plants, but the progress is slower than the anticipated. The current and future plan of the expansion is based primarily on conventional gas-fired combined cycle plant. Therefore the proposed project activity is in conformance with the government policy especially of the region.

(12) Applicability of the proposed methodology across project types and regions *(please indicate)***:**

>>It is applicable to gas turbine combined cycle plant, gas turbine cogeneration plant, gas turbine plant, gas engine cogeneration and gas engine power generating plant by applying proper heat rate (efficiency) of the facility. There is no limitation on region where it is applied.

(13) Any other comments:

a) State whether any other source of information (i.e. other than documentation on this proposed methodology available on the UNFCCC CDM web site) has been used by you in evaluating this methodology. If so, please provide specific references:

>>None except reference books of combustion.

b) Indicate any further comments:

>>In case of cogeneration plant, as the natural gas consumption can not be divided simply for electric

power generation and for process steam production and it is not appropriate to divide it for the estimation of global warming gas emissions, it is reasonable to calculate the global warming gas emissions for the total quantity of natural gas supplied to gas turbine.

II. Proposed new monitoring methodology *(specify title here):* >>Monitoring methodology for natural gas-fired cogeneration system replacing oil-fired boilers.

In respect of the proposed new monitoring methodology, evaluate each section of annex 4 to the draft CDM PDD. Please provide your comments section by section:

(1) Brief description of new methodology:

Describe new methodology:

>>The emissions of the proposed project are calculated based on the measured quantity of natural gas consumed for electric power generation and process steam production for monitoring. The emissions are calculated separately and summed for the calculation of the total emissions.

Note: It is recommended to calculate the total global warming gas emissions based on the total quantity of natural gas supplied to gas turbine not separately. As the quantity of the product is measured, the consumed energy for the production of process steam and electric energy supplied to the process are calculated using the relation of the quantity of products with the energy consumption and electric power consumption of the baseline.

(2) Key assumptions/parameters:

a) List the implicit and explicit key assumptions. Identify those, if any, which are problematic and explain:

>>Process steam/ton of the product assumed constant for the estimation of the quantity of steam by the quantity of the products: The relation shall be preferably identified by the actual data of the baseline.

Carbon emission factors are taken from IPCC: It is preferable to calculate them using the analysis data of the actually used fuels.

The energy contents of fuels (hearting values) are supplied by the project participant: It is preferable that such data as the energy contents are provided by an authorized third party.

The electric power generating efficiency (heat rate) of the grid and the onsite are assumed 8,612Btu/kWh and 12,000Btu/kWh respectively: As for the assumption, it is preferable that the former shall be proved by the power grid operating company and the latter shall not be used for the calculation of the natural gas consumption for the electric power generated. The natural gas quantity consumed by the cogeneration plant shall be measured at the inlet of the gas turbine, not be the calculated value using heat rate.

b) State whether the key assumptions are arrived at in a transparent manner:

>>Basically they are arrived at in a transparent manner. But the methodology for the estimation of global warming gas shall be modified for better accuracy and transparency.

c) Give your expert judgement on whether the assumptions/parameters are adequate:

>>From practical viewpoint, they are adequate except that the calculation of global warming gas emissions which shall be based on the measured quantity of natural gas.

(3) Data sources and data quality:

a) Indicate which data sources are used and how the data are obtained (e.g. official statistics, expert judgement):

>>All data related to oil and natural gas* also including their analysis data and electric power consumption are obtained from the project participant (Corn Products Brazil): It is preferable that the analysis of fuels for baseline and natural gas for the proposed project is done by an authorized third party.

* It is not clear who analyze the properties of the natural gas.

Carbon factors are taken from IPCC Guidelines: It is preferable that the data are obtained based on the analysis data of the actually used fuels for more accuracy.

Grid efficiency is based on Gas Turbine Handbook: It is preferable that the data are provided by the electric

grid operating company who supplies or buys the electric power.

Heat rate assumptions are supplied by the manufacturers: It is reasonable at the design stage.

Onsite efficiency is based on typical efficiency of new on-site diesel generation unit: It is not clear how and for what purpose the data are used. It shall be explained clearly.

b) Give your expert judgement on whether the data used are adequate, consistent, accurate and reliable:

>>They are not adequate and accurate from view point of accuracy, but it may be acceptable from the practical view point. For example, for the measurement of natural gas quantity, it is required to measure the condition of the fluid such as temperature and pressure for the necessary corrections for both fluid and measuring device. It is not clear that the key items of the measurement are corrected for the standard consistent conditions.

c) S*tate possible data gaps:*

>> There will be a slight difference between the measured global warming gas quantity and the true quantity. As for the proposed project, the global warming gas quantity shall be estimated based on the natural gas quantity measured at the gas turbine inlet and it shall not be divided into that for process steam generation and electric power generation. As for the estimation of the global warming gas quantity of baseline, the process steam quantity to be produced and the electric power to be purchased from the grid shall be calculated based on the quantity of the processed corn products at the monitoring stage.

(4) Assessment of the description of the proposed methodology and its applicability:

a) State whether the proposed methodology has been described in an adequate manner:

>>It is not described in adequate manner especially from the view point of accuracy and it requires the explanation how the quantities of natural gas for the process steam production and electric power generation are obtained both for PDD and at the monitoring stage.

b) State whether the proposed methodology is appropriate for the referred proposed project activity and the referred project context (described in Sections A-E of the draft CDM-PDD and submitted along with annex 4):

>>Though some additional explanation of natural gas consumption (distribution of natural gas to process steam production and to electric power generation) and the measures for attaining accuracy is required, the proposed methodology is appropriate for the proposed project activity.

c) State whether this proposed monitoring methodology is compatible with the proposed baseline methodology described in annex 3 of the draft CDM-PDD:

>>The proposed monitoring methodology is compatible with the baseline methodology as far as the relation of the process steam consumption and the electric power consumption with the quantity of the processed corn quantity is grasped.

(5) Leakage *(please elaborate, if appropriate)***:**

>>Outside of the boundary, there are energy consumption and fuel leakage for production and transportation of the fuels. But the quantities are relatively small and the difference of the consumption and the leakage between the baseline and the proposed project activity is negligible usually. Therefore the leakage outside of the boundary is neglected.

Inside of the boundary, there will be emissions of CH4 and N2O. But the quantities are negligibly small and the difference between the baseline and the proposed project is small. Therefore they are neglected.

(6) Quality assurance and control procedures *(please explain)***:**

>>The main instruments for the measurement of the key parameters such as the quantity of fuel consumed and electric power generated are quality-controlled in accordance with the company's quality control procedure based on ISO 9000 and 14000.

(7) Potential strengths and weaknesses of the proposed monitoring methodology *(please explain)***:**

>>Potential strengths:

The methodology to reduce global warming gas emissions is simple and transparent such as fuel switching from oil to natural gas, application of combined cycle cogeneration for power generation and process steam production which utilizes exhaust heat from gas turbine, which requires relatively simple and transparent monitoring (measurement and calculation) of global warming gas emissions.

The key parameters to be measured with high accuracy are limited to such as the natural gas quantity consumed, electric power generated and the processed corn products.

Potential weakness:

It is explained that the quantity of global warming gas emissions are calculated for the process steam production and for power generation separately using heat rate as shown by the calculation formula. But as the method is confusing, it shall be calculated of the total quantity of natural gas supplied to the gas turbine or the quantity of the natural gas supplied to the gas turbine plus the natural gas supplied to the boiler in case that the boiler is in operation.

(8) Applicability of the proposed methodology across project types and regions *(please indicate)***:**

>>The proposed methodology is applicable to any cogeneration of electric power and process steam as far as natural gas is available.

(9) Any other comments:

a) State whether any other source of information (i.e. other than documentation on this proposed methodology available on the UNFCCC CDM web site) has been used by you in evaluating this methodology. If so, please provide specific references:

>>None. Technical knowledge of combustion of fuels especially of chemical reactions and the knowledge of thermal power plant system and operation are essential for the evaluation of baseline methodology and monitoring metodology.

b) Indicate any further comments:

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Signature of desk reviewer ***Masatoshi Hisatome***.....

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