CDM: Proposed New Methodology
Meth Panel recommendation to the Executive Board
(version 06)
(To be used by the Meth Panel to make a recommendation to the Board regarding a proposed new methodology)

Date of Meth Panel meeting:	04 – 08 September 2006
Related F-CDM-NM document ID number (electronically available to EB members)	F-CDM-NM0121:
Related F-CDM-NMex document ID number(s) (electronically available to EB members)	F-CDM-NMex0121 Thomas / Ullrich
Related F-CDM-NMpu document ID number(s) (electronically available to EB members)	F-CDM-NMpu0121 Duchem / Shigeo / McCully

Note to those completing this form, as applicable: Please provide recommendations on the proposed new baseline and monitoring methodologies based on an assessment of CDM-NMB and CDM-NMM 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. Final recommendations by the Meth Panel

(1) History of submission *(to be communicated by UNFCCC Secretariat):*

>> First Submission (Round 11; 01 June 2006)

I. Recommendation on the proposed new baseline methodology: *(checkmark the choice made)*

Title of proposed new baseline methodology:> Hydropower Projects that Creates New Reservoirs or Expand Existing Ones

a. To approve this proposed methodology with minor changes

☐

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

>>

ii. Minor changes:

>>

b. To reconsider this proposed methodology, subject to required changes

☒

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

- There is sufficient publicly available information to document in a transparent and conservative manner the nature of the prohibitive barriers to which the proposed project activity is subject, and the nature of the means by which its registration as a CDM activity would enable the project to overcome those barriers (and thus be successfully undertaken);
- There is sufficient publicly available information to document in a transparent and conservative manner that the proposed project is occurring in a sector and investment context that does not feature the type of proposed activity as a common practice;

- The project will provide electricity to the electric grid, displacing power that would otherwise be provided by other generating sources through the operation and expansion of the electric sector. The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available;
- The project is in an electric sector that is not dominated by generating sources with zero- or low-operating costs such as hydro, geothermal, wind, solar, nuclear, and low-cost biomass, and this fuel mix is expected to persist for the duration of the crediting period;
- Electricity exports are included in electricity generation data used for calculating and monitoring the baseline emission rate to avoid potential leakage.
- Methodology will apply in cases where reservoirs are created or expanded as a result of a hydroelectric project.

ii. Required changes:

The feedback information obtained from the project proponent (PP) has actually moved the submission forward. However, some required changes were not addressed, neither were clarifications on why they should be retained given in the feedback from the PP. It is important to point out that for reservoirs below 4 W/m2, the uncertainties inherent in the measurements required in this methodology may be so significant that there is a chance that no CER will be realized. The point here is that although the measurement/monitoring are possible, they are very difficult to implement. In addition, such measurements are characterized by a high level of uncertainties which will require a comprehensive elaboration of statistical significance.

The major issues remaining to be addressed by the PP include:

- The first and second applicability conditions should be deleted as they are not really applicability conditions but a condition that applies to all CDM projects;
- The fifth applicability condition is actually not an applicability condition and should be removed. Instead, the fact that electricity exports are included in electricity generation data used in calculation of the baseline should be included in the methodology;
- Air sampling methodology is proposed to be used at representative points in the reservoir for estimating and monitoring emissions. There is a need to provide guidance within the methodology on how statistical significance will be incorporated into the measurement at each cluster. In this sense, a statistical protocol has to be provided;
- Equally important is the need to include in the new methodology, how measurements at clusters will be generalized to provide emission estimates for the entire reservoir area. The pertinent point here is that there is a need for the submission to provide statistically robust framework to generalize point measurements at clusters as well as providing sound method to generalize such measurements to the entire reservoir, while at the same time incorporating the uncertainties. Here too a statistical protocol has to be provided;
- Another issue that will need to be addressed in the new methodology is the variability in the temporal and spatial dimensions of the measurements at a typical reservoir. Although it can be argued that this may be well captured in the uncertainty analysis, the existence of such variability is a good factor that will determine the selection of the clusters where measurements will be carried out. It is important that the procedure in which this will be carried out should be well articulated in the new methodology. Here too a statistical protocol has to be provided;
- The baseline emission factor will either come from a CM analysis of a grid, where such exists or from historical data on captive generation or their default. The vintage of the data required for the determination of the baseline EF was not satisfactorily clarified in the feedback although this need was stressed in the initial evaluation of the submission. More information must be provided to clarify the age of national data that will be used.;
- The adequacy, consistency, accuracy and reliability of the database used in this methodology need to be addressed. In its present form, the adequacy, consistency, accuracy and reliability of some of the data representing some of the parameters are difficult to determine. For example, emission flux

values for reservoirs may be reliable only for project areas located in the tropical regions where default values for such parameter is available in the absence of measurements, although it is not clear enough, given the current level of scientific knowledge, whether or not default values can be used at all;

- There is a need to establish consistent differentiation between degassing, diffusion and bubbling emissions in the methodology. These are not very clearly established in the current format of the submission. Furthermore, while N_2O emissions were mentioned in some part of the submission, it was not properly covered in some sections. For example N_2O emissions was not addressed in the monitoring part;
- There is a need to expatiate more on quality assurance procedure in the submission.

(Project participants shall make required changes to the proposed new methodology and send it back to the Meth Panel. The proposed new methodology will be reconsidered by the Meth Panel if changes required are made by the project participants. The Executive Board will only consider this proposed new methodology after the revised proposed methodology has been reconsidered by the Meth Panel.)

c. Not to approve the proposed methodology

☐

i. Reasons for non-approval:

>>

(A new proposal should be submitted in accordance with the procedures for submission and consideration of proposed new methodologies of the Executive Board.)

II. Recommendation on the proposed new monitoring methodology: *(checkmark the choice made)*

Title of proposed new monitoring methodology: >> Hydropower Projects that Creates New Reservoirs or Expand Existing Ones

a. To approve this proposed methodology with minor changes

☐

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

>>

ii. Minor changes:

>>

b. To reconsider this proposed methodology, subjected to required changes

☒

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

- There is sufficient publicly available information to document in a transparent and conservative manner the nature of the prohibitive barriers to which the proposed project activity is subject, and the nature of the means by which its registration as a CDM activity would enable the project to overcome those barriers (and thus be successfully undertaken);
- There is sufficient publicly available information to document in a transparent and conservative manner that the proposed project is occurring in a sector and investment context that does not feature the type of proposed activity as a common practice;
- The project will provide electricity to the electric grid, displacing power that would otherwise be provided by other generating sources through the operation and expansion of the electric sector. The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available;
- The project is in an electric sector that is not dominated by generating sources with zero- or low-

operating costs such as hydro, geothermal, wind, solar, nuclear, and low-cost biomass, and this fuel mix is expected to persist for the duration of the crediting period;

- Electricity exports are included in electricity generation data used for calculating and monitoring the baseline emission rate to avoid potential leakage;
- Methodology will apply in cases where reservoirs are created or expanded as a result of a hydroelectric project.

ii. Required changes:

- Monitoring methodology must be fine-tuned to incorporate all the required changes elucidated above for the baseline methodology section;
- Particularly important is the incorporation of statistical significance in the determination of clusters which are used in monitoring emissions from point sources in the reservoir. The monitoring methodology proposes the use of air sampling at representative points in the reservoir. Results from such an exercise will not be reliable if statistically significant clusters are not determined before generalizing such measurements to the entire reservoir;
- There is a need to include N_2O explicitly in the monitoring methodology. The new submission accepted the fact that N_2O must be included in the gases to be considered in the baseline calculations but did not include it adequately in the monitoring protocol. This must be changed;
- Quality assurance procedures that will form part of the monitoring methodology should also be properly explained in the draft.

(Project participants shall make required changes in the proposed new methodology and send it back to the Meth Panel. The proposed new methodology will be reconsidered by the Meth Panel if changes required are correctly made by the project participants. The Executive Board will only consider this proposed new methodology after required changes proposed have been made and the revised proposed methodology has been reconsidered by the Meth Panel.)

c. Not to approve the proposed methodology

☐

i. Reasons for non-approval:

>>

(A new proposal should be submitted in accordance with the procedures for submission and consideration of proposed new methodologies of the Executive Board.)

B. General information on submitted proposed new methodology

(1) Title of proposed new baseline methodology:

Hydropower Projects that Creates New Reservoirs or Expand Existing Ones

(2) One sentence describing the purpose of the methodology.

This methodology is designed for hydro electric power projects, based on new or expanded reservoirs, and which are connected to small-sized grids that also include alternative, off-grid generation resources.

(3) Summary description of baseline methodology.

Short statements on each on how the proposed methodology: chooses the baseline scenario, demonstrates additionality, calculates baseline emissions, calculates project emissions, calculates leakage, calculates emission reductions.

The methodology expands the application of ACM0002 to hydro electric plants that create new reservoirs or expand existing ones as and when applicable based on the power density of the hydro reservoir (based on EB 23 recommendations). The "Tool for the demonstration and assessment of additionality" is used for the assessment of baseline scenarios and for additionality. The proposed baseline methodology has two components: a) estimating reservoir emissions as project emissions and b) estimating baseline emissions for grid connected renewable projects, where the project represents a special case (in addition to what has been defined in ACM0002) wherein a diesel emission factor (on the grounds that in developing countries, hydro facilities can displace significant amounts of off-grid diesel generation as well as grid connected electricity generation facilities) is used. The diesel-generation default emission factor is defined according to the method described in the small scale diesel category baseline method with a default value as 0.8 tCO2/MWh to be used for both grid and off grid energy supply. In its current form, the methodology includes an ex-post correction of emission calculations to account for emissions of methane from the hydro electric facility reservoir using fixed default values of emissions fluxes of 190 mg/m²/day for CO_2 and 200 mg/m²/day for CH_4. Ex post measurements are used since it is currently not possible to make accurate predictions of these emissions ex ante.

(4) Title of proposed new monitoring methodology:

Hydropower Projects that Creates New Reservoirs or Expand Existing Ones

(5) Summary description of the monitoring methodology.

Short statements on each on how the proposed methodology monitors the baseline and project scenario and calculates leakage and emission reductions.

The methodology utilizes and extends ACM0002: by broadening its application mainly in the following ways: include hydro reservoir expansion projects; allowing the use of a diesel emission factor to calculate emissions reductions (the emission factor is taken from the approved small scale diesel generator baseline methodology); and incorporates monitoring of CH_4 and CO_2 from reservoirs through air sampling at representative points in the reservoir. For the latter, the proposed monitoring methodology suggests measuring CO_2 and CH_4 above the newly created (or extended) reservoir to monitor these emissions over the crediting period. As the preferred method, the proponent suggests to use air sampling at representative points in the reservoir to measure the increase in concentrations of GHGs that are emitted to chambers. Measurement results will be reported in mg/m²/day and will be multiplied by the respective cluster area the sample belongs to. Different samples will be taken over each year since emission fluxes vary according to seasons and weather. The methodology proposes to define clusters across the reservoir. Each cluster should correspond to a certain water depth or vegetation type that will be flooded. For all other data related to the specifics of the project, the monitoring methodology will use monitoring elements provided in ACM0002. The methodology is reflected in the CDM-PDD in so far as the proponent provided tables outlining a cluster and that can be used as a template to record the measurement results.

(6) Relationship with approved or pending baseline and monitoring methodologies (if applicable).

a) Does the proposed new methodology include part of an already-approved methodology or a methodology pending approval (see recent EB reports)? If so, please briefly note the relevant methodology reference numbers (AMXXXX or ACMXXXX), titles, and parts included.

ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources".

b) In particular, is the proposed new methodology largely an amendment or extension of an approved methodology? (i.e. the methodology largely consists of expanding an approved methodology to cover additional project contexts, applicability conditions, etc., and is thus largely comprised of text from an existing methodology) If so, indicate whether the amendments or extensions are appropriate, and explain why.

Extension of ACM0002. It could be applied appropriately.

c) Indicate whether , and explain how, any other approved methodology (not noted in response to the previous question) could currently, or with minor modifications, be used to calculate emission reductions from the project activity associated with the proposed new methodology. If so, please indicate the reference number and the parts of the methodology that would need modification.

No other approved methodology can currently or with minor modifications be used to calculate emission reductions from project activity associated with the proposed new methodology.

d) Please briefly note any significant differences or inconsistencies (baseline emission calculations, leakage methods, and boundary definitions, etc.) between the proposed new methodology and already-approved methodology of similar scope.

As explained in c) there are no approved methodology that is close in terms of possible application with this proposed new methodology as such the issue of differences or inconsistencies does not arise.

e) To avoid potential repetition, feel free to provide one comprehensive answer here that covers questions a through d.

The proposed new methodology utilizes part of ACM0002 and no other approved methodology either as is or with minor modifications is utilized in any part.

C. Details of the evaluation of the proposed new methodology by the Meth Panel:

I. Proposed new baseline methodology: >>

(1) Determining the baseline scenario and demonstrating additionality:

a) Explain the methodological basis for determining the baseline scenario, and whether this basis is appropriate and adequate.

The project developer will use the same methodology in ACM0002 to analyze the potential scenarios and undertake the analysis required to ensure that among all the alternatives none is likely to happen except the baseline scenario. The project developer will also use Step 1 of the Additionality Test tool to look at the potential scenarios. In the case of a hydro project, possible alternatives could include;

- other zero emitting energy resources (wind or biomass);
- developing the hydro-project without the involvement of CDM;
- importing more electricity;
- using other fossil fuels to generate that electricity or continuing with the current situation; or
- doing nothing and facing possible supply constraints or more off-grid resources like diesel generation.

The project developer will review these and other possible scenarios, ensure that one or more alternative is legal under local laws, and develop an analysis for why options that provide the same or similar levels of GHG emissions as the proposed hydro project are not able to be implemented. The basis for determining baseline scenario and demonstrating additionality is appropriate and adequate.

b) Explain 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 could result in a baseline scenario that reasonable represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity.

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?

The methodology when combined with information contained in ACM0002 provides adequate information on how its application can be used to show that the project activity is additional and therefore not the baseline scenario. To achieve this, the project participants will use: the methodology in ACM0002; Step 1 of the CDM EB Additionality Test Tool; and a comprehensive listing of alternative baseline scenario.

d) Explain whether the basis for assessing additionality is appropriate and adequate:

The basis for assessing additionality is appropriate and adequate.

(2) Methodological basis for calculating baseline emissions and emission reductions

a) Explain how the methodology calculates baseline emissions and whether the basis for calculating baseline emissions is appropriate and adequate:

Baseline emissions are estimated as the sum of emissions from grid electricity displaced plus emissions resulting from the carbon stock that would be eliminated as a result of inundation. The grid electricity emission is calculated as the product of the baseline emissions factor multiplied by the electricity supplied by the project activity to the grid. The baseline emission factor is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors. Calculations for this combined margin must be based on data from an official source (where available) and made publicly available. The combined margin approach is outlined in ACM0002. The baseline scenario also includes an adjustment for any carbon sequestration that would likely have occurred in the baseline case in the area inundated by the reservoir $\Delta CO2_{FF}$ in year y. As with ACM0002, in most cases EFy will be adequately dealt with through the combined margin approach outlined by ACM0002. In some cases, however, the combined margin approach does not necessarily give the most appropriate or conservative outcome. To deal specifically with cases in which the grid is very small (under 5 generating units greater than 15MW capacity[1]) or underdeveloped providing electricity to less than 50% of consumers it would be more appropriate to take the more conservative of the following: a) the combined margin as outlined in ACM0002 using the best available data or b) the small scale default for high efficiency diesel generation 0.8 tonnes of CO_2/MWh. By definition, this approach would provide a more appropriate and conservative result than employing the combined margin approach alone since it takes the more conservative of the two numbers. It also seems appropriate given that in many of the CDM countries/electricity grids that fit this definition are likely to rely on less than highly efficient diesel generators to meet the electricity needs of many of its people and may be the most likely source of new generation capacity given the relatively low investment costs and investment barriers when compared to large scale grid connected electricity. For example, in a case where fewer than five generation plants of greater than 15MW exist on the grid and analysis showed using the combined margin approach that the emissions factor was 0.95 tonnes of CO_2/MWh, the combined margin could be over-counting the emissions impact of a renewable energy project, if that project replaced less carbon-intensive diesel units. Taking the small scale default of 0.8 tonnes of CO2/MWh would produce a more conservative and likely more accurate result.

Emissions from the carbon stock that would be eliminated as a result of inundation is estimated using the following argument: if the dam project would not have occurred, the land covered by the reservoir would otherwise not have been flooded and thus might have been a net carbon sink. This part of the methodology

[1] The numbers for this definition were chosen based on the current rules of the combined margin approach in ACM0002 which suggests one approach to calculating the build margin would be based the most recent 5 plants installed. It would seem reasonable that if there are less than five plants meeting the Marrakech Accord's Definition for a large scale generating unit, then another approach might provide a more conservative result since the most recent five plants or the most recent 20% may include very old units which give little insight into future investments.

accounts for carbon that would not be sequestered because of this project. To deal with this issue, the project participants suggest following approach based on the Good Practice Guide on LULUCF projects to calculate changes in carbon stock in each type of land that will be flooded. The project participants will prepare sample control plots near the project site that correspond to the characteristics of each land type inundated in reasonable proximity to the reservoir site. For each year, the project participants would measure changes in carbon stock using sampling methods stated in the GPG to determine net GHG emissions (or sequestration). Each category of sample plot would develop a change in carbon stock in tonnes of CO_2/hectare/year and multiply that number by the number of hectares flooded (at maximum reservoir size) that correspond to each land category. The summation of these categories will equal the amount of carbon not being sequestered as a result of this project and provide a more accurate reflection of the baseline scenario.

The calculation of baseline emissions using the method elucidated above is appropriate and adequate.

b) Explain how the methodology calculates project emissions and whether the basis for calculating project emissions is appropriate and adequate.

Project emissions are calculated based on a sampling of reservoir emissions, using standard gas collection sampling technology. Added to this will be estimates of changes of carbon stocks if the project were never constructed, particularly if the area being flooded is a net carbon sink. This methodology proposes to be applied in cases where reservoirs are created or expanded. Studies indicate that hydroelectric power reservoirs can emit substantial amounts of methane, as well as CO_2. Methane is emitted from reservoirs that are stratified and where the bottom layers are anoxic (lacking oxygen), leading to degradation of biomass through anaerobic processes. Where the water is well oxygenated, degradation of biomass generates carbon dioxide, not methane. Based on extensive research and field measurements, it is impossible to tell beforehand how much reservoir emissions there will be. Emissions will vary depending on a number of factors, and thus the most practical way to determine emissions is to simply monitor them after the dam impoundment takes place. This methodology will therefore monitor emissions of methane and CO_2 that are emitted from reservoirs. The preferred method will be the use of air sampling at representative points in the reservoir to measure the increase in concentrations of GHGs that are emitted into chambers. Samples of the gases within the chamber will be taken over a short period of time to calculate emissions at that point, as measured in milligrams of gas (CH_4, N20 or CO_2) emitted per square meter per day. These samples will be taken over different sections as the reservoir (since reservoir emissions or "flux" can vary at different points of the reservoir, often depending on depth or type of vegetation flooded). Samples will also be taken at many times during the year since flux also varies according to season and weather. All together, this testing and sampling process should obtain an accurate estimate of GHG emissions from a reservoir created by a dam. The exact procedures are described in the project emissions section of the monitoring methodology.

The framework for calculating project emissions may not be appropriate and adequate as emissions from reservoir cannot be practically measured with precision. There is a need for the submission to provide statistically robust framework to generalize point measurements to the entire reservoir. Also, the methodology as is currently conceptualized does not offer any technique to deal with emissions that will take place after the crediting period. This may be a serious source of temporal leakage.

(3) 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

>> Gases: CH_4, N_2O and CO_2;

Sources:

- national electricity grid including all power plants, the project boundary includes the project site and all the power plants connected physically to the electricity grid that the CDM activity (hydro facility) is connected to. The project electricity system (i.e. regional grid) is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints.
- all off-grid diesel generators in especially poor countries where no developed grid exists,
- the new (or extended) reservoir as result of the dam construction.

ii) Physical delineation

>>

- national electricity grid including all power plants, the project boundary includes the project site and all the power plants connected physically to the electricity grid that the CDM activity (hydro facility) is connected to. The project electricity system (i.e. regional grid) is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints.
- all off-grid diesel generators in especially poor countries where no developed grid exists,
- the new (or extended) reservoir as result of the dam construction and degassing immediately downstream of the dam.

b) Indicate whether this project boundary is appropriate:

>> The project boundary is appropriate.

***(4)* 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 CDM-NMB):*

As stated in an earlier section of this review, the proposed methodology may not be appropriate for the referred project and the referred project context as the estimation of the project emissions is based on measurement of emissions from a sample of the reservoir. Not only is it very difficult to measure such emissions with reasonable accuracy, statistically robust framework for converting the point measurements to overall reservoir emissions are difficult to implement. Furthermore, as currently prepared, the methodology does not have key components for dealing with emissions from the reservoir after the crediting period. This is a source of temporal leakage which must be incorporated into the framework before it can be appropriate.

(5) Key assumptions/parameters (including emission factors and activity levels), rationale, data sources and uncertainties:

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

>> Key assumptions and rationale of this methodology are summarized below:

- All the implicit and explicit assumptions inherent in the utilization of the relevant portion of ACM0002;
- For required ex-ante calculations, average values for CO_2 and CH_4 emission fluxes are assumed for tropical regions. It is assumed that these figures can be used regardless of the type of vegetation to be flooded such as forests, grassland etc.
- No decrease of CO_2 and CH_4 emissions in the reservoir over time are assumed. Gross emissions (including natural emissions) are assumed.
- Frequent sampling over different parts of a reservoir is possible and can provide a realistic and accurate measurement of GHGs from the reservoir.

- Measurements taken from statistically significant clusters can be generalized to estimate emissions for the entire reservoir area.

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

>> The assumptions especially the one relating to the measurement of emissions from sample clusters from the reservoir and their adequacy in the estimation of overall reservoir emissions may be problematic.

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

>> Official National data as well as data from international sources such as IPCC is used to determine the build/operate margin and the diesel emission factor as well as default emission factors utilized in this new methodology. Similarly, information needed in the selection of clusters from where measurements of emissions from reservoirs are to be taken will be based on Official National land data for the various categories of land to be flooded and their potential or tendency to release or store CO_2 and CH_4.

d) Explain the vintage of data recommended (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 data is not clear. Further information is required to clarify how old the national level data needs to be included. It is stated that local data will be collected ex post and the data will be current. With respect to CH_4 and CO_2 emission fluxes, the default fixed values may not be appropriate. The emission fluxes represent results from 2002/2003 measurements in tropical reservoirs. Long time series (e.g. a 10 or 20 year time series) of emissions fluxes from the same reservoir do not exist yet in many cases. Attention should be given to changes of emissions fluxes of reservoirs over many years. While in the first years of flooding new area, CO_2 and CH_4 fluxes increase exponentially, fluxes will decrease as the reservoir gets older, as shown in some reservoir emission measurement campaigns. The methodology makes no differentiation of emission fluxes over time.

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

>> Provided a reasonable vintage for the data is defined (e.g. 3 to 5 years old) and the data is adequately referenced/sourced, most of the data used could be considered generally adequate, consistent, accurate and reliable. However, for some parameters, data used are not adequate and accuracy is hard to determine based on the information provided. For instance, the emission flux values may be reliable for reservoirs only in those regions that are almost identical to tropical regions where the measured emission fluxes were chosen.

f) State possible data gaps:

>> There is a need to differentiate between degassing, diffusion and bubbling emissions. Information on N_2O emissions need to be more explicitly covered.

(6) Assessment of uncertainties:

a) *Provide an assessment of uncertainties given (e.g. in determining baseline scenario, data sources, key assumptions)*

>> Although better addressed after the first feedback some inadequacy still exist. The methodology still does not explicitly address uncertainties related to algorithms and formulae used. Given that the methodology is based on ACM0002, it is not expected that uncertainties be repeated, however there are additional algorithms and extensions of ACM0002 concepts and formulae (that are not applied in ACM0002 for hydro reservoirs that displace off grid diesel generators).

The key uncertainties are associated with the variation in reservoir emissions (measured through air sampling techniques) and the amount of off grid diesel generation capacity that is replaced by the proposed project.

In the absence of a full understanding of uncertainties related to reservoir emissions from a scientific point of view, the proponent should refer to the major discussed uncertainty sources in literature and try to relate them to the emission factor discussion. For instance, available data and statistics do not allow defining, with an acceptable uncertainty on a scientific basis, the average rate of decomposition of the flooded organic material, the net GHG emissions for many reservoirs studied. Further uncertainties should be discussed such as decline of annual CO_2, CH_4 emissions over time etc. It must be emphasized that frequent

measurement of emissions will not eliminate the need to incorporate uncertainties in the algorithm for estimating emissions from the reservoir.

The methodology suggests the use of the default diesel emission value from the small scale diesel generation category baseline. The figure is taken from the small scale diesel generation approved baseline. Uncertainties regarding the use of this emission factor for a larger scale projects should be addressed.

(7) Leakage:

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

>> The creation of a reservoir may influence development patterns in the area immediately surrounding the new water feature. There is the potential for further land-use changes beyond the inundated area directly resulting from the creation of the reservoir. The project developer will have to monitor the reservoir lake boundaries. While some human activities can be seen as fitting within the context of sustainable development which will be assessed by the host-country DNA's, major deforestation will be considered leakage. The deforested areas will be quantified and calculated in the exact same way described in the baseline section and can utilize the same test plots to measure the impact of the deforestation on the land as a carbon sink or emitter caused by the creation of the reservoir. These impacts will be considered leakage.

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

>> This treatment of leakage is appropriate and adequate as long as the required quantification can be clearly implemented.

(8) Transparency, "conservativeness" and consistency

a) Indicate whether the baseline methodology is presented in a transparent way, and if not, what changes are suggested:

>> In its feedback, the project proponent tried to present again the baseline methodology in a more transparent way. However, there still remains some grey areas that will need more elucidation:

- It is not clear how air sampling methods that will be utilized on statistically significant clusters will be utilized to estimate emissions from the entire flooded area;
- There is a need to address the fact that emissions from reservoir cannot be practically measured with precision. It will be necessary to provide statistically robust framework which can be used to generalize point measurements to the entire reservoir;
- The baseline methodology as is currently conceptualized does not offer any technique to deal with emissions that will take place after the crediting period. This may be a serious source of temporal leakage;
- There is a need to provide more elucidation on the vintage of the data required to implement the baseline methodology.

b) Explain whether the baseline methodology is conservative, and if so, how:

>> The baseline methodology as proposed may not be conservative. For example, current methodology for estimating project emissions which is based on air sampling measurement may underestimate such emissions and hence overestimate emission reduction achievable.

c) Explain whether the baseline methodology is internally consistent, and if not, highlight which sections are inconsistent:

>> As proposed, the baseline methodology is internally consistent. The only problem lies with the implementation of the techniques proposed to perform project emission estimation.

(9) If relevant, state whether the proposed changes required for the methodology implementation on 2nd and 3rd crediting periods are appropriate.

>> There would be no changes required for the methodology implementation on 2nd and 3rd crediting periods.

(10) State the baseline approach selected, indicate whether this is appropriate, and why.

>> Existing actual or historical emissions, as applicable. This project will compare the project scenario with what the emissions would have been from the continuing of fossil fuels used to generate electricity. Thus, comparing this to historical emissions, which would have occurred under the baseline scenario. This is appropriate.

(11) Any other comments:

a) State which other source(s) of information (i.e. other than documentation on this proposed methodology available on the UNFCCC CDM web site) have been used by you in evaluating this methodology. Please provide specific references:

>> None

b) Indicate any further comments:

>> No further comments

II. Detailed recommendations on the proposed new monitoring methodology

Evaluate each section of CDM-NMM. Please provide your comments section by section:

(1) Indicate if this proposed monitoring methodology is compatible with the proposed baseline methodology described in CDM-NMB of the draft CDM-PDD, and if not, why.

>> As currently conceptualized, the proposed monitoring methodology is compatible with the proposed baseline methodology. However, the changes required in the baseline methodology will mean that the monitoring methodology must be fine-tuned to ensure continued compatibility.

(2) Assessment of key assumptions/parameters:

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

>> Many assumptions have been considered with respect to monitoring approach related to reservoir emissions. The key ones are:

- Cluster building is required because the land to be flooded is unlikely to only represent one vegetation type. One must assume a different behaviour of different vegetation types in terms of their emission fluxes over time. Such assumption is plausible.
- CO_2 and CH_4 emission levels alter over a year due to changing weather and climate conditions, which requires multiple samples to be taken and analysed over a year. The assumption is plausible.
- Gross emissions are measured. The methodology does make a clear provision for factoring out natural CO_2 (and CH_4) emissions to get net emissions. This assumption is plausible.
- All reservoir samples should be taken in floating chambers. This assumption is plausible.
- No monitoring is required for the displacement of off-grid diesel generators. This seems erroneous and needs to be substantiated or changed accordingly.

b) State whether the key assumptions are adequate, and whether they have been arrived at in a transparent manner:

>> All assumptions with the exception of the one relating to monitoring of displacement of off-grid diesel generators are transparent.

(3) Data sources and data quality:

a) Give your expert judgement on whether the data sources and data quality used are adequate, consistent, accurate and reliable. If not, please explain.

>> The following are the specific data sources:

Data obtained from expert opinion of the dam operator: Square meters of reservoir surface area, and different categories to measure in flux testing

Data to be measured: Emissions of CH_4, - Concentration of CH_4 at water in take; Concentration of CH_4 in water downstream of dam; Total volume of water moving through dam; Electricity produced at hydro plant

Public sources of information including IPCC data: Carbon emissions factor for the grid; Carbon emission

factor for the operating and build margin; Total emissions from the grid; Total electricity to the grid; Amount of fossil fuel used in the grid; GHG co-efficient of each fuel; Electricity generation of the plant; List of plans for operating margin and list of plans in build margin; Total electricity generation of imported power; Carbon co-efficient of imported electricity; Weight factor of operating margin; Evidence of barriers to proposed project; Evidence of alternatives to proposed projects.

The data to be used for determining project emissions represents measured data. Depending whether a laboratory expert or newly trained staff will collect and analyse the samples, the data quality might vary thereby giving rise to the question of reliability and also uncertainties. Uncertainties with determining emissions from degassing downstream of the dam are mentioned (CDM-NMM, page 8/9), if the same method is used as measuring CH_4 and CO_2. A suggestion is made for a modified measurement procedure, which would look adequate. The data used should be expanded to include monitoring data for off grid diesel generators if displaced by the proposed project.

b) *State possible data gaps:*

>> No identifiable data gaps

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

>> The proposed methodology incorporates analysis of leakage from reservoirs but due to uncertainty and lack of data for the sampling of methane from reservoirs it is recommended that ex post measurements of emissions from reservoirs are used. The monitoring methodology should explain how possible leakage will be quantified (measured or calculated, recorded using questionnaires and/or other methods).

(5) Quality assurance and control procedures (please explain):

>> Although slightly more information on QA/QC has been provided in the feedback. However better handling of QA/QC should be incorporated. The methodology expands the procedures included in ACM0002 by requiring frequent samples of emissions from the reservoir and the proposed project site.

Field tests and ex-situ analysis (laboratory analysis) have different accuracies. To be able to get comparable results only one detection method (either in-situ or ex-situ) should be allowed, otherwise allowance should be made for corrections in case a detection method with a lower precision is used. The QA/QC discussion should clearly refer to the issue of "rejected fluxes", meaning those samples that result in a lower correlation coefficient than a defined value. Such standardised value must be provided and agreed to, to keep the quality of detected values under a certain level of control. A large percentage of "rejected fluxes", however, would mean that costs for monitoring increase.

(6) Assessment of the description of the proposed methodology:

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

>> The proposed methodology has been described in an adequate manner

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 CDM-NMM):

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

(7) 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

b) Indicate any further comments:

>> No further comments

Signature of Meth Panel Chair ……..
Date: 21/06/2006 *(Rajesh Kumar Sethi*

Signature of Meth Panel Vice-Chair ……..
Date: 21/06/2006 *(Jean-Jacques Becker)*

Information to be completed by the secretariat	
F-CDM-NMmp doc id number	F-CDM-NM0121
Date when the form was received at UNFCCC secretariat	13 September 2006
Date of transmission to the EB	13 September 2006
Date of posting in the UNFCCC CDM web site	13 September 2006