CDM: Proposed New Methodology
Meth Panel recommendation to the Executive Board
(version 04)
(To be used by the Meth Panel to make a recommendation to the Board regarding a proposed new methodology)

Date of Meth Panel meeting:	6 - 9 September 2005
Related F-CDM-NM document ID number (electronically available to EB members)	F-CDM-NM0112: "Increased electricity generation from existing hydropower stations through Decision Support System optimization"
Related F-CDM-NMex document ID number(s) (electronically available to EB members)	F-CDM-NMex0112: Fazio
Related F-CDM-NMpu document ID number(s) (electronically available to EB members)	F-CDM-NMpu0112: None received

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

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

Title of new baseline methodology:>> Increased electricity generation from existing hydropower stations through Decision Support System (DSS) optimization.

a. To approve this proposed methodology with minor changes

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

>>

i. Minor changes:

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

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

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The methodology applies:

- Only to existing hydropower generation units and reservoir capacity. The methodology can include multiple units linked in a cascade including both run of the river and reservoir-based units.
- Where the data required to determine the efficiency of the existing hydro units and the total flow index is reliable and readily available
- To hydropower systems that lack advanced Decision Support System (DSS) optimization controls and modelling required to optimize generation potential
- Only includes optimization of generation units that were online as of the historical data year(s) used for the methodology

- Only to those power generation units that have not undergone significant upgrades beyond basic maintenance, which would affect the expected operational efficiency levels during the duration of the project.
- Only where accurate data is available to measure and document the additional energy generated by existing hydro stations beyond the baseline case
- Only where no dam height is added as a result of the project to increase reservoir size.
- Only where either no additional hydro power units are located down river from the last unit within the project boundary, or the first hydro unit downstream from the final hydro unit within the project boundaries has the capacity to regulate at least 24 hours of maximum flow from upstream (24 hour capacity in m3 = Mean annual flow m3/s *24 hr*3600 s/hr).

ii. Required changes:

>> The methodology builds upon existing methodologies and provides a rigorous approach to assessing the benefits of DSS systems. The methodology is especially well-written and easy to follow. During the feedback loop, the proponent has addressed most of the key concerns. The remaining issues are the following:

- Number of historical data years.

  Proponent has provided a response to our concerns that the range of flows during the index development year does not span the range that might be encountered in future (post-implementation) years and that one year of data may not be adequate to robustly characterize the baseline flow-output relationship. The suggested solution is that "For weekly flow index data points in the project year that are higher or lower than the limits of baseline data set, the project developer will not seek to claim emission credits." The proponent suggests that this will "provide incentives to gather additional years of baseline data beyond the minimum one year through market mechanisms rather than mandates." While this nicely addresses the first concern (range of data) it does not appear to address the concern about how representative one historical years' data might be. For instance, the proponent will have no "market-based incentive" to include data for historical years that fall within the same flow range and provide a higher output per flow relationship. In fact, this approach provides a "market-based incentive" to do just the opposite. It is thus still suggested that either the baseline data should in general consider multiple years, and that use of a single year should be an exception with clearly articulated circumstances in which this is acceptable. Or that an alternative be proposed that adequately addresses the above concern. Note also that the current CDM-NMB should also be made more consistent in terms of its reference to a "baseline year" (e.g. p. 4) vs. the possibility that "if possible, multiple years of data should be included into the baseline calculations" (p. 18)

- Flow measurement uncertainty.

  The proponent has responded with some useful comments and additions with respect to uncertainty. However, it has been remarked that uncertainty in flow measurements may equal or exceed the project-driven improvement in efficiency of the system. Given this possibility, it would be useful for the proponent to address the uncertainties in a more systematic manner.

- Confidence in Emission Reduction Calculations.

  Given that both flow rate measurement and the flow-output relationship present significant uncertainties, together with the small relative difference in output due to the DSS project, the proponent should provide a procedure to ensure the statistical significance of estimated emission reductions.

(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

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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 new monitoring methodology: >> Increased electricity generation from existing hydropower stations through Decision Support System optimization

a. To approve this proposed methodology with minor changes

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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.):

>>

The methodology applies:

- Only to existing hydropower generation units and reservoir capacity. The methodology can include multiple units linked in a cascade including both run of the river and reservoir-based units.
- Where the data required to determine the efficiency of the existing hydro units and the total flow index is reliable and readily available.
- To hydropower systems that lack advanced DSS optimization controls and modelling required to optimize generation potential.
- Only includes optimization of generation units that were online as of the historical data year(s) used for the methodology.
- Only to those power generation units that have not undergone significant upgrades beyond basic maintenance, which would affect the expected operational efficiency levels during the duration of the project.
- Only where accurate data is available to measure and document the additional energy generated by existing hydro stations beyond the baseline case.
- Only where no dam height is added as a result of the project to increase reservoir size.
- Only where either no additional hydro power units are located down river from the last unit within the project boundary, or the first hydro unit downstream from the final hydro unit within the project boundaries has the capacity to regulate at least 24 hours of maximum flow from upstream (24 hour capacity in m3 = Mean annual flow m3/s *24 hr*3600 s/hr).

ii. Required changes:

>> See concern related to QA/QC and uncertainty analysis for flow index data as noted above.

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

I. Proposed new baseline methodology *(specify title here):* >> Increased electricity generation from existing hydropower stations through Decision Support System optimization.

(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:

>> Methodology provides a means to parameterize the historical relationship between river flow (or volume) and generation. The actual generation under DSS operation for a given flow can then be compared to the generation under the historical operation, for the same flow. [Decision Support Tools are designed to calculate the optimal use of the generating capacity of a hydro generating unit or a series of hydro generating units by taking advantage of all the controllable factors (head, reservoir capacity, spillage, time of use, etc.) and best available information.]

This difference in generation is summed over each week of the year to establish the total amount of additional energy generated (in megawatt-hours). This energy is assumed to displace the other grid based electricity sources; for this purpose, ACM0002 is applied to estimate these emissions.

b) State the approach selected:

>> The approach selected is as per paragraph 48 (a) of the CDM modalities and procedures: "Existing actual or historical emissions, as applicable".

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:

>> Yes, it is, since it is based on an historical flow-output relationship.

(2) Basis for determining the baseline scenario:

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

>> Yes it does, and lays out 2 specific alternatives that should be considered and a process for considering them. However, it does not specify that the methodology is not applicable if Alternatives 1 or 2 are the most likely case.

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

>> The flow-output relationship will be identified using a best-fit polynomial relationship using data from 52 consecutive weekly records (or a time period yielding a more accurate result).

Generation from a hydroelectric unit is equal to the flow passing through the turbine times the head (forebay elevation minus tail-water elevation) times a "power" factor (which includes the efficiency of the turbine). Generally, turbine efficiency curves (that is, generation as a function of flow for a particular head) are not linear. The head can also vary non-linearly with flow. Thus, a flow vs. generation relationship should be non-linear. In addition, under high flow conditions, exceeding hydraulic capacity has the effect of "flattening" out a generation vs. flow curve, which adds more non-linearity to the relationship.

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?

>> Yes, the "Tool for the demonstation and assessment of additionality" is used and appropriately adapted to the project type.

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

>> Yes it is.

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

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

>> This methodology has been described adequately in the documentation. There are a few points that should be emphasized, however. It should be stated more clearly that the "benefits" of implementing the DSS operation must be computed over an entire year. There will be times when the generation under a DSS operation will be less than that under the baseline (i.e. cases when the reservoir is drawn down in weeks prior to an expected increase in natural flows). These negative results imply that additional thermal units may have to be dispatched, which would lead to higher levels of emission during those weeks. Thus, these negative results must be summed up along with the positive weekly results to yield an accurate annual benefit.

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-NMB):

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

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.

>>Yes it should.

Please explain:

>> It suffices for the case considered.

(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 methodology described for this project is generic in that it can be used for any hydroelectric system.

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

>> The spatial scope relates to the hydro system operations affected by the project, which 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:

>> Data from a baseline year (52 weeks), pre-implementation (year prior to commencement) will be used to define the flow-output relationship. It has been argued that it is sufficient, however, there may be situations (abnormally wet or dry periods or excessive withdrawals by other water users) that might render a given baseline year inappropriate. This needs to be further addressed by defining the conditions for an appropriate baseline year. It is suggested that "if possible, multiple years of data should be included into the baseline calculations to provide a more robust depiction of baseline conditions." If multiple years are available, it is unclear why they should not be used by default.

(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

>> The gases and sources would be as defined by ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources".

ii) Physical delineation

>> The project boundary includes the area circumscribed by the hydro generation units using the Decision Support Tools. If various units do not share a connected water source, they will need to be calculated separately (i.e. if the project developer is working on with two hydro dam cascades on two non-connected rivers.). The electricity grid to which the hydro units are delivering their output constitutes the full system boundary

b) Indicate whether this project boundary is appropriate:

>> Yes it is.

(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:

>>

- The flow/generation relationship defined for a given year will be sufficiently robust to be applicable to other years and conditions
- One of the key assumptions is that implementing a DSS operation will (always) improve hydroelectric output. Overall, this may be true but two issues must be made clear 1) that the annual average improvement will vary due to hydrologic and weather conditions (i.e. there may be years when the DSS operations does not increase production over historical operation) and 2) that weekly operations under a DSS may actually produce less energy (so that more can be produced later).

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

>> They are not particularly transparent in the CDM-NMB but have been clarified in response to questions.

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

>> The relevant assumptions are adequate, as long as the major changes above (I.b.ii) are addressed.

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

>> For this method to be viable, historical flow and generation data must be available at all hydro facilities. Weekly average flows below each dam, taking into account both turbine flow and spill, will be used along with average weekly generation to establish a flow/generation relationship at each dam.

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

>> Yes, they are. One key element is to ensure that same techniques are used to measure flow and generation in both the baseline year and post-implementation period. This appears to be taken into account in the CDM-NMM.

f) State possible data gaps:

>> None observed.

(7) Assessment of uncertainties:

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

i) The basis for determining the baseline scenario:

>> No.

ii) Algorithms/formulae:

>> The methodology does not include a specific explanation of how uncertainties in the flow-generation best fit will be dealt with.

iii) Key assumptions:

>> The baseline scenario can be adequately characterized by the polynomial adjustment between flow rate and generation.

iv) Data:

>> No mention of data uncertainty is made. Further discussion of the uncertainty related to flow measurement techniques would be helpful, along with how quality and conservatism can be ensured.

b) State whether the uncertainties presented are reasonable:

>> See comments above.

(8) Leakage:

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

>> No leakage is expected.

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

>> Not necessarily. Leakage could occur if downstream units are affected by the DSS. See comments under I.b.ii.

(9) Transparency and "conservativeness":

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

>> The baseline methodology is very simple and easy to understand.

b) State whether the baseline methodology is conservative:

>> Using a flow/generation relationship based on historical data to assess the baseline generation for a given flow level is neither conservative or not conservative.

Otherwise, the methodology could be conservative in cases where upgrades are made or new additional are added, since any DSS-related emissions reductions would not be included.

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

>>

Strengths:

- This methodology is simple and easy to implement.
- It is easy to understand and explain.
- By establishing a relationship between flow and generation for each hydroelectric unit, this methodology eliminates any complicated "calibration" to assess gains in energy production.

Weakness:

- Limited historical basis, if only one year's data are used.

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

>> The methodology states that "In cases where actively enforced laws mandating the use of Decision Support Tools are in place, the project will not be considered additional." There may be circumstances where other policies might affect water withdrawals from the system that might have a significant effect on water availability and flow relative to the baseline years. Such situations should be addressed.

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

>> The methodology should be very widely applicable.

(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:

>> Responses to questions provided by the PP.

b) Indicate any further comments:

>> No further comments.

II. Proposed new monitoring methodology *(specify title here):* >> Increased electricity generation from existing hydropower stations through DSS optimization.

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

(1) Brief description of new methodology:

Describe new methodology:

>> The purpose of the monitoring methodology is to establish a procedure to measure hydroelectric generation gains from implementing a DSS. The methodology proposes that weekly average flows and generation under a DSS operation be measured and then compared to the historical generation produced under the same flow conditions. This difference in generation is summed over each week of the year to establish the total amount of additional energy generated (in megawatt-hours). This energy is assumed to displace the operation of thermal resources and decrease the overall emission of greenhouse gases.

(2) Key assumptions/parameters:

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

>> Same as the CDM-NMB above.

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

>> Yes.

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

>> Yes.

(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):

>> Same as the CDM-NMB above.

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

>> Yes they are.

c) *State possible data gaps:*

>> No apparent gaps.

(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:

>> The assumption is that weekly flow and generation will be measured in the same way that historical data was obtained. It is important that similar methods be used. If improvements in measuring flows are made, then some adjustments may have to be done to the computation of benefits.

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):

>> Yes it is.

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

>> This methodology is compatible with the proposed baseline methodology.

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

>> Not applicable.

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

>> The measuring techniques used to obtain flow and generation data must be clearly defined, along with any information regarding embedded uncertainties. Should the measuring method or devices change, the procedure for calculating benefits should be revisited to assure that it still provides the same level of conservatism.

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

>> Same as for the baseline methodology above.

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

>> Same as for the baseline methodology above.

(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.

b) Indicate any further comments:

>> No further comments.

Signature of Meth Panel Chair ……..

Date: 14/09/2005 *(Jean-Jacques Becker)*

Signature of Meth Panel Vice-Chair ……..

Date: 14/09/2005 *(José Miguez)*

Information to be completed by the secretariat	
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