**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)***

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| *Date of Meth Panel meeting:* | 31 January – 03 February 2006 |
| *Related F-CDM-NM document ID number (electronically available to EB members)* | F-CDM-NM0112-ev:<br>"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-rev<br>Not applicable |
| *Related F-CDM-NMpu document ID number(s) (electronically available to EB members)* | F-CDM-NMpu0112-rev<br>Not applicable |

*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. Preliminary recommendations by the Meth Panel

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

>> Previously submitted as NM0122.

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

Title of proposed 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

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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):

>> 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 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:

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- Define the methodology more specifically to ensure that "this methodology is only applicable as long as there are no major changes to reservoir size or hydro facility equipment (spillways, turbines) that would affect water flows within the project boundary." (Note this also implies that variable definitions on page16 should be changed to refer to "units in the project boundary" rather than "units that existed in the baseline period."). For example, on page17 it is stated that, "the addition of new generating capacity may add a significant layer of uncertainty to the project results". This would render invalid the baseline scenario, as it is represented by the historical flow-output relationship. This would be the case with other changes to the system. If this recommendation is not acceptable, then a more convincing analytical basis should be provided to support the argument that the error will be "almost always" on the conservative side.
- To ensure that the project benefits are statistically significant, the baseline output level (Baseline Electricity Generation) should be calculated at a 95% confidence level (i.e. using the mean output of the flow-output relationship plus two standard deviations). This should be represented in the equations. This would address concerns about the fundamental uncertainties of the flow-output relationship, and the possibility of a low signal-to-noise ratio.
- The possibility of negative emission reductions at year end should be explicitly noted, and in such cases, EB guidance on negative emission reductions should be added (Para 18 of EB 21 meeting report).
- The relevant information and equations for the "third order, 12-coefficient polynomial form of the flow-generation curve (power vs flow and head)" should be included in the methodology, so as to enable its application by other methodology users (as well to enable full review). It is stated that "the derivation and discussion …is included in the attached document", however, no such document has been posted with the NM0112rev submission.
- Other, more minor changes include:
    - Cleaning up and standardization of equations would be helpful. For example, x is used for weeks and for years. (for consistency, use "y" for years). Since ACM0002 is used for estimating the emissions reductions, it would be helpful to use consistent terms for common items such as electricity generation ($EG_y$, $EG_{baseline}$, $BE_y$, etc.). Equations should be numbered. For example, equations on p.16 should be expressed in a more standard form, e.g. the first equation should show "EG = sum of …", variable names should be used rather than units (e.g. Q

turbines not m3)

- Specify in the baseline scenario selection section that if the current water management practice is not the most likely baseline scenario, then the methodology is not applicable.
- The applicability conditions as per above required changes should likely be changed to limit applicability to systems with no changes

*(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

☐

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 Decision Support System 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:

>>

- Include monitoring parameter(s) needed to measure spillway flows. For example, spillway flows may depend on adjustable spillway openings, the extent of opening which would need to be included in the monitoring methodology.

*(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:**

>> Increased electricity generation from existing hydropower stations through Decision Support System optimization.

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

>> This methodology is designed for projects that increase electricity generation from existing hydropower stations through Decision Support System optimization.

**(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.*

>> This 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.

**(4) Title of proposed new monitoring methodology:**

>> Increased electricity generation from existing hydropower stations through Decision Support System optimization.

**(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 purpose of the monitoring methodology is to establish a procedure to measure hydroelectric generation gains from implementing a Decision Support System (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.

**(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 is applied to estimate electricity emissions savings.

*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.*

>> No.

*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.

*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.*

>> None.

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

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

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

**(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.*

>> Yes it does, and lays out 2 specific alternatives that should be considered and a process for considering them.

*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.*

>> Yes it is.

*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 "Tool for the demonstration and assessment of additionality" is used and appropriately adapted to the project type.

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

>> Yes it is.

**(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:*

>> 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.

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

>> There are no project emissions.

**(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*

>> The gases and sources would be as defined by ACM0002.

*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.

***(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):*

>>

**(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:*

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

>> Yes.

*c) 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.

*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:*

>>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.

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

>> Yes.

*f) State possible data gaps:*

>> None.

**(6) Assessment of uncertainties:**

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

>> The revised CDM-NMB addresses measurement uncertainties but there are still concerns related to uncertainty in the underlying flow-output relationship. As a result, uncertainty is proposed to be included in the quantification as noted in the minor changes suggested above.

**(7) 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:*

>> Yes.

**(8) Transparency, "conservativeness" and consistency**

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

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

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

>> 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.

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

>> It is consistent.

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

>> Not applicable.

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

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

**(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:*

>> Responses to questions provided by the PP.

*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.**

>> It is compatible.

**(2) Assessment of 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 adequate, and whether they have been arrived at in a transparent manner:*

>> Yes.

**(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.*

>> Yes they are.

c) *State possible data gaps:*

>> No apparent gaps.

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

>> Not applicable.

**(5) 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.

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

*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.

**(7) Any other comments:None**

*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: 13/02/2006 *(Jean-Jacques Becker)*

Signature of Meth Panel Vice-Chair ……..

Date: 13/02/2006 *(José Miguez)*

| **Information to be completed by the secretariat** | |
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