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June 25, 2010

CDM Executive Board
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Subject: Call for public inputs on the specific aspects of a methodology framework for estimating GHG reductions from replacing fuel-based lighting with LED Systems

Honorable Members of the CDM Executive Board,

We welcome the opportunity to contribute to this call for inputs. Based on our experience in working to achieve improved lighting under the CDM framework, it is clear that the existing methodologies are not sufficient to enable full exploitation of the GHG mitigation potential offered by fuel-based lighting replacement projects.

The following response is based on the experience of the World Bank and in consideration of Annex 13 to the report of the 25th meeting of the SSC Working Group.

We will be glad to provide any further information and clarifications as necessary.

With kind regards,

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Recommendations regarding the specific aspects of a methodology framework for estimating GHG reductions from replacing fuel-based lighting with LED Systems

1. Context

The one published global estimate of greenhouse-gas emissions from fuel-based lighting places the value at 190 million tonnes of CO_2 per year (Mills 2005)[1], which is potentially higher than total emission reductions anticipated from projects between 2008 and 2012[2]. Therefore, these projects for fuel based lighting replacement by LED, SHS or solar lamps etc. can make a substantial contribution to climate change mitigation and improve the quality of lives of people benefitting from improved lighting. These projects clearly *should* be viable under the CDM and PoA framework however to date large numbers of rural fuel displacement projects especially for lighting applications have not entered the CDM. We therefore welcome this initiative by the SSC WG to prioritize methodology improvements for these projects. We would like to encourage the SSC WG to ensure that any methodological improvements made as a result of this call for inputs are not limited to fuel based lighting replacement with LED lighting technology projects exclusively as other replacement options such as SHS, solar lamps and others will also greatly benefit from methodological improvements as outlined in the following response.

2. Are kerosene or other fossil fuel lamp replacement projects viable as CDM projects or PoAs?

Given the highly dispersed nature of kerosene or fossil fuel lamp replacement projects are most viable under the PoA framework. However, due to uncertainties associated with the existing regulatory framework for PoAs (i.e. DOE liability resulting in refusal to validate second CPA, eligibility criteria uncertainty etc.), successful registration for these kinds of projects appear to be more certain under existing CDM framework although with higher monitoring and transaction costs.

Under the current CDM framework, however, there are still barriers to fuel based lighting replacement projects. To promote fossil fuel lamp replacement projects actively, the following issues need to be considered and addressed:

1. Standardizing baselines (mainly fuel consumption per lamp, hours of operation, number of kerosene lamps replaced per lamp of efficient lighting used etc) considering lack of data availability and higher monitoring costs
2. Simplifying monitoring requirements since the key challenges to the implementation of AMS.II.C and AMS.II J are related to the selection of sampling groups and implementation of a monitoring concept.
3. Simplifying additionality demonstration (for all sizes of energy/fuel saving potential)

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[1] Mills, E. (2005): The Specter of Fuel-Based Lighting, *Science* 308:1263–1264.

[2] *World Bank (2010): 10 Years of Experience in Carbon Finance - Insights from working with the Kyoto mechanisms*

4. Furthermore, all of the above should be specifically defined for PoAs, especially in LDCs

In our responses to the questions raised by the SSC WG, we seek to address these areas below with suggestions that draw upon the World Banks experience.

3. Is it better to use existing methodologies for fossil fuel lamp replacement projects and POAs or would be it better to develop a technology specific methodology?

There are three methodologies for lighting projects, AM0046 *Distribution of efficient light bulbs to households*, AMS.II.C "*Demand-side energy efficiency activities for specific technologies*" and AMS.II.J *Demand-side activities for efficient lighting technologies*. All these methodologies are for grid connected areas and are not for off-grid applications. AMS II.J introduces a deemed savings approach which alleviates monitoring requirements but does not completely eliminate them. The methodology has been shown to considerably reduce CER volumes compared to the other two methodologies[3] (Michaelowa et al 2009) and thus project developers have to assess the trade-off between higher monitoring costs and lower CER volumes.

Given the potential for GHG mitigations under fossil fuel lamp replacement projects and POAs, a technology specific methodology with standardized baselines and default data is relevant for both grid and off-grid. Based on the experience of grid based lighting methodologies, a new methodology that targets fuel-based lighting should build on and expand the positive elements of the existing methodologies whilst addressing their limitations. For example, see table below, which outlines the limitations of existing grid-based lighting methodologies that make them not particularly suitable to the replacing fuel-based lighting.

Method	Issue	How addressed	Comments
AM0046	Regulators criticized unchanged usage pattern & required 4 sampling groups of at least 100 households. Regulators were concerned that behavioral changes of CFL users would lead to an increase of emissions. Concern that CFLs would break down quickly in developing country conditions resulted in stringent monitoring requirements.	Issues solved by referring to the additionality tool, baseline lamp utilization, and the intensity of monitoring.	It is unlikely that AM0046 will ever be applied due to the complexity of monitoring requirements.
AMS.II.C	The monitoring part of the methodology is cumbersome. It consists of 15 equations and 15 parameters to be monitored. The derivation of the parameter of operating hours, which are measured for the baseline (GLS) prior to the distribution in a number of representative sample households and for the project (CFL) continuously during the whole crediting period in a representative sample group is challenging. The majority of parameters (average wattage, number of replaced and distributed lamps, operating hours), which will only be monitored during the actual project period, need to be estimated.	Defining estimates for parameters can be done using a market survey which needs to be representative and traceable. When distributing the lamps, household specific data are recorded on one distribution form per household and the destruction of the replaced GLS is monitored. After the meters have been installed in the sampling group and metering has been done for a specified period, monitoring can be done. It is also necessary to check how many of the installed CFLs are in operation.	Cumbersome monitoring resulting in higher transaction costs, complexity and greater project risks.
AMS.II.J	The parameter values are derived from ex-ante	The following parameters are	The deemed savings

[3] Michaelowa et al (2009): *Challenges for energy efficiency improvement under the CDM—the case of energy-efficient lighting* Energy Efficiency 2:353–367.

	survey results specific to the project location. The methodology generates significantly less CERs than the other methodologies based on monitoring due to a very conservative assumption on average daily utilization of CFLs and the need to deduct baseline penetration of CFLs.	"deemed" for CFL programs: (a) lighting usage hours, (b) type of baseline technology, (c) power rating of the baseline equipment. The permanence of CFL usage is not a deemed parameter, since unpredictable grid characteristics in developing countries will have differing impacts on lifetimes of project CFLs.	methodology has relaxed monitoring requirements of AMS-II.C and AM0046 with regards to CFL use duration, and hence is an important breakthrough.

4. Would a methodology that allows for a conservative value for default emissions savings be viable? What if it only allowed a CER crediting period of 2 or 3 years? Should the methodology allow for a monitoring option for development of emission reduction values and persistence of savings?

Not only is a methodology that allows for a conservative value for default emission savings viable, it is clearly necessary, since a major limitation of existing methodologies is that the monitoring requirements are very cumbersome, data intensive and costly. These are the major obstacles with the existing methodologies (see discussion in 3 above).

Default data needs to be updated, and the timeline for this should be made clear from the start. However, in general a 2 or 3 year crediting period is considered very limited given the high transaction costs and time needed for project implementation. It is recommended that usual crediting periods are applied as it is important to increase certainty in the market. The SSC-WG may wish to consider an *adjustment factor* or an *autonomous improvement rate*, perhaps linked with the economic growth rate of the country or the income growth in the project area. An economic indicator might prove an effective proxy as studies suggest that improvement in quality of life and movement up the fuel-ladder is directly linked with disposable incomes.

Experience so far suggests that due to a lack of data and high costs associated with monitoring the required parameters in the existing methodologies, a monitoring option within the new methodology is unlikely to be successful unless the approach is different to the approaches defined in the already approved methodologies (see table above).

To overcome the existing monitoring limitations, it is recommended that a new methodology should ensure that monitoring requirements focusing on the collection of parameters that will assure that lighting units are operating as anticipated and provide information on leakage and an adjustment factor is adopted based on one or more indicators. This approach would be realistic and cost effective to implement in comparison to the existing monitoring approaches.

5. Comments on the following issues to identify how (a) they should be addressed in a methodology and (b) how they could be used for determining a conservative savings default value.

It is useful for the methodology to define each of the parameter below and provide multiple approaches that the PE can choose from, with appropriate justification.

Issue i: Pre-existing fuel-based technology

- ***Fuel lamp types;***

As there are different kinds of lamp types in use in most of the rural areas and it is difficult to implement surveys to identify the % of each type of lamps, it is recommended that the fuel lamp type is not fixed by the methodology or require to be fixed by the PE. Instead, it is better to fix the average fuel use rate considering a mix of various types of lamps and average usage, perhaps the same as the value In AMS II.J

- ***Fuel use rate (liters/hour);***

This is can be established using one of the following options:

a) Sample household survey in the project area;
b) Fixed fuel use rate based on a lab test data or research literature available for the project country or area; and
c) A default value of 0.03 liters/hour/lamp. Any value between 0.025 and 0.04 liters/hour should be acceptable for developing countries. This is also based on our experience with Bangladesh and other countries.

- ***Utilization (hours/day and days/year***);

In project locations where there is limited variability in lighting utilization a default of 5-6 hours for 365 days per annum is considered conservative. In project locations where seasonal variation impacts lighting utilization 3.5 hours per day instead of normal 5-6 hours of usage per day and 365 days per annum could be considered reasonable and conservative. The basis for the 3.5 hours draws on results from a survey conducted by the World Bank for a solar home system program in Bangladesh.

- ***Fuel emissions factor (kg CO2 /liter);***

It is recommended that the following options are provided:
a) lab test result;
b) national values for the fuel; and
c) IPCC default emission factors

- ***Suppressed demand factor;***

In our opinion, it is not appropriate to include a suppressed demand multiplier in the equation, since this is only relevant once a certain quality of life level of lighting has been reached. Moreover, the social and economic benefits that are expected out of improved light levels should not be penalized with introduction of suppressed demand factor. Hence, as long as light 'replacement ratio' i.e. 1:1 as mentioned in the supporting note is established and leakage levels are ascertained (refer to comments on leakage below), there should not be any further need for such factor.

- ***Changes in lamp usage due to factors such as oil price increases/decreases/subsidies, numbers of people per household, income, and electrification;***

  It is not anticipated that these factors are likely to have a significant impact on CERs within the proposed crediting period. Therefore we recommend that these parameters are assessed and adjustments made to equation outcomes at the end of each crediting period to avoid unnecessary increase in transaction costs for processing the projects as these factors do not impact on environmental integrity of projects.

Issue ii: Project Technology

- ***Which new technologies and characteristics should be included (LED lamps with or with grid charging);***

We recommend that LED lamps with grid and off-grid charging be included, as well as other solar lighting options (i.e. solar lamps, SHS etc).

- ***Leakage (destruction or not of replaced lamps);***

Based on our Bangladesh experience, it is clear that households try to retain the existing lamps mainly to use in case of non operation of project based lighting systems. However, usage of baseline systems along with project systems, with increased demand for lighting, cannot be ruled out. For off-grid households, considering that they do not have alternative lighting sources, consideration of leakage is an unnecessary penalty. These households do not have the purchasing capacity or the ease of access to buy candles, torches, hurricane lamps, power generators or other lighting sources, in case the project technology is not working or additional lighting is required, on a temporary basis. Therefore, application of a 50% leakage factor, as currently prescribed in the SSC-WG report annex is too conservative. These projects are not going to result in large volume of emission reductions per household and therefore consideration of leakage will only limit such CDM projects

- ***Number of lamps replaced per new technology (e.g., LED) lamps;***

The approach suggested in the note i.e. 1:1 on a conservative basis is reasonable as long as there are no further reductions in emission reduction values with introduction of factors to address suppressed demand or leakage.

- ***Service life;***

This can be fixed as per the technology used and specifications of manufacturers. As system operational status will be monitored at recommended frequency levels, it may not be required to specify and fix the service life of the lamps initially.

- ***Net to gross ratios for free ridership;***

Considering the data constraints and the high-level of subjectivity in the calculation of NTG, it would be advisable for a ration to be defined beforehand, similar to the value (0.98) used in AMS II.J

The effect of free ridership and spillover is aggregated to the NTG ratio, which can be expressed as:

NTG = (1-FR) x (1+SO)

Where:

FR is the share of free ridership (fraction)
SO is the share of spillover (fraction)

There are four main approaches to determine the NTG ratio: (a) self-reporting survey, (b) enhanced self reporting surveys,(c) econometric methods (such as statistical models that use survey inputs) and
(d) Stipulated (or deemed) NTG ratio where the NTG ratio is estimated using information available from evaluation of a similar program (NAPEE, National Action Plan for Energy Efficiency, 2007).

It is recommended that a deemed NTG ratio is applied based on data that is available from existing projects. These values can be regularly updated and validated. Since in some cases, data for the calculation of the NTG may not exist a default value similar to that proposed in AMS II.J should be included in the methodology.

- ***Power conversion losses for grid charging***;

In our opinion, the amount of energy used (from grid) for charging cell phones and batteries in off-grid areas is very negligible and hence the effects can be neglected. Moreover, there may be a high possibility that such charging will be performed using community level diesel generators and hence implementation of project based systems results in to reduction of diesel consumption.

Methodologies for energy efficiency in grid-connected areas allow the PE to account for reduction in T&D losses. This methodology could simplify the calculations by ignoring all conversion and transmission losses, as good quality lighting without connection to the grid is expected to have more benefits from reduced T&D losses than it has losses from power conversion

- ***Quality standards;***

Any standards or specifications available locally meeting country specific conditions or any guidelines specified by local regulators should be allowed. For LED systems, at this point, national and international standards are not widely available.

- ***Allowable operating modes (such as PV or grid charging);***

As these kind of applications more relevant and will be implemented in off-grid areas i.e. in rural areas, PV based systems can be allowed initially.

6. Comments on the calculation of conservative emission reduction default factors as indicated in the tables located near the end of Annex 1

Emission reduction default factors are useful, but should be defined for different types of technology and for different ages of technology. Please consider our suggestions above on some of the default values suggested for calculations