Information note

Rationale for the default factor used in AMS-III.AR to account for suppressed demand

I. Background

1. Paragraph 105 of the sixty-seventh meeting report of the Executive Board (hereinafter referred to as the Board) of the clean development mechanism (CDM) (EB 67) envisages that revision of AMS-III.AR "Substituting fossil fuel based lighting with LED/CFL lighting systems" is explored as a priority for the application of the "Guidelines on the consideration of suppressed demand in CDM methodologies".

2. To respond to request from the Board at EB 67 the SSC WG at its thirty seventh meeting agreed to recommend a revision of AMS- III.AR. This document provides the rationale and justifications for the default value for baseline emission factor in paragraph 13 of the draft revision of methodology AMS-III.AR "Substituting fossil fuel based lighting with LED/CFL lighting systems" (See annex 6 to the SSC WG 37 report).

3. The SSC WG took into account several submissions received requesting to amend AMS-III.AR to account for suppressed demand e.g. SSC_620.

II. Analysis and recommendation

4. The proposed modification to account for suppressed demand is based on an analysis of minimum service for lighting in rural households.

(a) A joint report by the International Energy Agency, United Nations Development Programme and United Nations Industrial Development Organisation assumed two 15W CFLs consuming approximately 20% of the total electricity in households that have basic energy services (IEA 2010) i.e. based on two 15W CFLs run for 5 hrs/day for 365 days consuming 55 kWh. This is a value used in the approved methodologies AMS-I.L "Electrification of rural communities using renewable energy" and AMS-III.BB. "Electrification of communities through grid extension or construction of new mini-grids";

(b) Applying Steps 1 to 5 in paragraph 11 of the "Guidelines on the consideration of suppressed demand in CDM methodologies" results in defining a pressure kerosene lamp as the technology baseline for the LED lamps defined as the project activity in AMS-III.AR "Substituting fossil fuel based lighting with LED/CFL lighting systems";

(c) The lighting service (useful lighting) provided by two 15W CFLs is 240 lux at typical working distance whereas the lighting service from a kerosene pressure lamp at typical working distance is 182 lux (Mills, 2003);

(d) The two CFLs considered are seen to provide 30% more light than the one pressure

kerosene lamp considered. The flow rate assumed for one kerosene pressure lamp is 146 L/year.[1] Increasing this by 30% results in flow of 190 L/year.

In AMS-III.AR, the household (five lamps) lamp fuel use rate is assumed to be 160 L/year (= 0.025 L/hr x 3.5 hr/day x 365 days/year x 5 lamps per household). (see paragraphs 8 and 13 of AMS-III.AR);

(e) Note that the value of 0.025 L/hr for the rate of fuel use is taken from an expert input (Mills, 2010) which in turn derived it from a baseline study of one registered CDM project as well as a citation from the Petroleum Conservation Research Assocation.[2] It is explained in the report that this value is a reasonable conservative approximation in lieu of superior local data;[3]

(f) Therefore, **it is proposed that suppressed demand be addressed by increasing the fuel use rate assumed for the baseline lamps (FUR) to 0.03 liters/hour**, which results in an annual flow rate of 192 L/year (= 0.03 L/hr x 3.5 hr/year x 365 days/year x 5 lamps per household);

(g) In addition it is noted that the methodology allows for:

(i) A dynamic baseline factor (DB_y) that accounts for increases in fuel consumption rates, which are an indicator of suppressed demand;

(ii) Alternative values for calculation of baseline emissions if adequate research/monitoring and documentation is provided.

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[1] Kerosene pressure lamps consume 0.08 litres of kerosene per hour (Mills 2003). At 5 hours lighting per day, this is 146 litres/year. (= 0.08 L/hr x 5.0 hr/day x 365 days/year)

[2] One of the two currently approved off-grid lighting projects conducted a baseline study of 98 homes and found the average to be 0.024 liters per hour.
See <http://cdm.unfccc.int/UserManagement/FileStorage/45VLX2N0KBF6I37POAUCSTMY9W8ZRE>. Det Norske Veritas (DNV) cites the Petroleum Conservation Research Association (PCRA) <http://www.pcra.org/English/domestic/comparison.htm> in support of a baseline kerosene lamp fuel utilization rate assumption of 0.025 liters per hour.

[3] There is a wide-range of fuel-based lighting sources and limited testing has been conducted. Rates range from 0.01 to 0.10 liters per hour, with most products operating in the 0.02 to 0.04 range (i.e. the small/medium wick lamps and the kerosene lanterns)

List of references

IEA (International Energy Agency). 2010. Energy Poverty: How to make modern energy access universal? Paris, Joint report by IEA, United Nations Development Programme (UNDP) and United Nations Industrial Developmetn Organization. Available at: <http://www.iea.org/weo/docs/weo2010/weo2010_poverty.pdf>.

Mills, E. 2003. Technical and economic performance analysis of kerosene lamps and alternative approaches to illumination in developing countries. Lawrence Berkeley National Laboratory Report. Available at: <http://evanmills.lbl.gov/pubs/pdf/offgrid-lighting.pdf>.

Mills E. 2010. From carbon to light. A New Framework for Estimating Greenhouse-Gas Reductions from Replacing Fuel-based Lighting with LED Systems. Prepared for the United Nations Framework Convention on Climate Change (UNFCCC), Small-Scale Working of the Clean Development Mechanism Executive Board. See annex 2 of the document available at: <http://cdm.unfccc.int/Panels/ssc_wg/meetings/025/ssc_025_an13.pdf>.

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History of the document

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