CLEAN DEVELOPMENT MECHANISM

CDM-SSCWG48-A03

Draft Small-scale Methodology

AMS-III.AV: Low greenhouse gas emitting safe drinking water production systems

Version 05.0

Sectoral scope(s): 03

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. The recommended revision of "AMS-III. AV: Low greenhouse gas emitting safe drinking water production systems is based on the following:

   (a) The Board agreed at its seventy-eight meeting to further work of simplification and streamlining of methodological products under MAP project 223, as per tables 1 to 4 of EB78 Annex 08; and

   (b) In SSC-WG 46, members agreed to Project 223 proposal to explore opportunities for simplification of two methodologies, AMS-III.AV and AMS-II.G.

2. Purpose

2. The proposed revision aims to:

   (a) Provide more specific guidance in applying the methodology including the calculation of baseline emissions to enable a standardized approach; and

   (b) Provide simplified and flexible monitoring procedures to reduce transaction costs without compromising environmental integrity.

3. Key issues and proposed solutions

3. Due to lack of specific provisions in the methodology, project proponents currently develop their own approaches to take into account certain conditions for applying the methodology.

4. To enable a standardized approach, the proposed revision introduces improvements in the current version of approved methodology as follows:

   (a) introducing new parameters in the formula used to calculate baseline emissions, which previously are left to users to develop on their own;

   (b) Standardizing methods to determine quantity of purified water, including flexible and simplified monitoring options to reduce transaction costs without compromising environmental integrity.

   (c) Introducing new parameters to be monitored in order to meet conditions in the methodology for claiming emission reductions. They may not necessarily be integrated into the calculation of baseline or project emissions but more specific guidance on monitoring and/or documentation in the project documents would ensure compliance with these conditions and minimize delays in project registration or issuance of CERs due to incomplete information.

4. Impacts

5. The proposed revision will facilitate the development and implementation of CDM project activities and Programme of activities/Component project activities (PoAs/CPAs) to

provide safe drinking water (SDW) to consumers who, prior to project implementation, were not connected to a SDW public distribution network and for which the common practice of water purification is or would have been water boiling. The project activities and CPAs covered under this methodology are very relevant to the least developed countries (LDCs) and other regions that are underrepresented in the CDM.

5. Subsequent work and timelines

6. The methodology is recommended by the SSC WG for consideration by the Board at its eighty-first meeting. No further work is envisaged.

6. Recommendations to the Board

7. The SSC WG recommends that the Board adopt this final draft methodology, to be made effective at the time of the Board's approval.

7. References:

(a) EB78 Annex 08 (Paragraph 1) - Further work on methodologies, tools and standards" (Version 01.0) available at <http://cdm.unfccc.int/EB/archives/meetings_14.html#78>.

(b) SSC-WG 46 Meeting report (Paragraph 21) - "Small-Scale Working Group forty-sixth meeting" (version 01.0) available at <https://cdm.unfccc.int/Panels/ssc_wg/index.html>.

(c) "Small-scale Methodology. Low greenhouse gas emitting safe drinking water production systems" (Version 04.0) available at <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved>.

TABLE OF CONTENTS **Page**

1. Introduction

1. The following table describes the key elements of the methodology.

Table 1. Methodology key elements

Typical project(s)	Project activities that introduce low GHG emitting water purification systems to provide safe drinking water and displace water boiling using non-renewable biomass or fossil fuels
Type of GHG emissions mitigation action	Displacement of a more-GHG-intensive output

2. Scope, applicability, and entry into force

2.1 Scope

2. This methodology comprises introduction of low greenhouse gas emitting water purification systems to provide safe drinking water (SDW). Water purification technologies that involve point-of use (POU) or point-of-entry (POE)[1] treatment systems for residential or institutional applications such as systems installed at a school or a community centre are included. The examples include, but are not limited to, water filters (e.g. membrane, activated carbon, ceramic filters), solar energy powered ultraviolet (UV) disinfection devices, solar disinfection techniques, photocatalytic disinfection equipment, pasteurization appliances, chemical disinfection methods (e.g. chlorination), combined treatment approaches (e.g. flocculation plus disinfection). The methodology is also applicable to water kiosks[2] that treat water using one or more of the following technologies: chlorination, combined flocculant/disinfection powders and solar disinfection. [3] In case the water kiosk is using solar disinfection, project proponents need to implement measures to prevent recontamination (e.g. disinfecting containers, sealing containers and hygiene training).

2.2 Applicability

3. This methodology is applicable under the following conditions:

   (a) Prior to the implementation of the project activity, a public distribution network supplying SDW to the project boundary does not exist.

   (b) It shall be demonstrated based on laboratory testing[4] or official notifications (for example notifications from the national authority on health) that the application of

[1] Please refer to the definition of Point of Use (POU)/ Point of entry (POE) in section 4.

[2] Please refer to the definition of water kiosk in section 4.

[3] According to "A toolkit for monitoring and evaluating household water treatment and safe storage programmes" (WHO – 2012) – Annex A - Summary of HWTS methods, the use of these technologies can provide protection against recontamination.

[4] The testing should be undertaken under conditions that are representative of the operation conditions of the project site(s) including feedwater.

the project technology/equipment achieves compliance either with: (i) the interim performance target as per "Evaluating household water treatment options: Health based targets and microbiological performance specifications" (WHO, 2011); or (ii) an applicable national standard or guideline;

(c) In cases where the life span[5] of the water treatment technologies is shorter than the crediting period of the project activity, there shall be documented measures in place to ensure that end users have access to replacement purification systems of comparable quality.

(d) It should be demonstrated that the maintenance of the project appliances is implemented in accordance with manufacturer's specifications/ recommendations, including any provisions in regards to replacement or cleansing of the involved filters.

4. Applicability of this methodology is foreseen in the following types of situations. If the renewable crediting period is chosen, these conditions shall be reassessed at the beginning of each crediting period:

(a) Case 1: Project activities implemented in rural or urban areas[6] of countries with proportion of rural or urban population using an improved drinking-water source equal to or less than 60 per cent confirmed by one of the options below:

(i) Proportion of populations using an improved drinking-water source for the most recent year for which data is available from WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation shall be used (<http://www.wssinfo.org/data-estimates/table/>) for this purpose. Definition of improved and unimproved drinking water source shall be as per the information provided by JMP;

(ii) Using official data such as publicly available statistical data from a government agency or an independently commissioned study by an international organization or an university;

(iii) Using survey methods (use 90/10 confidence/precision for sampling);

(b) Case 2: Project activities implemented in areas not included in Case 1.

2.3 Entry into force

5. The date of entry into force is the date of the publication of the EB 85 meeting report on 24 July 2015.

3. Normative references

6. Project participants shall apply the "General guidelines for SSC CDM methodologies", "Guidelines on the demonstration of additionality of small-scale project activities" and "General guidance on leakage in biomass project activities" (Attachment C to Appendix

[5] The rated average life of each system type shall be known ex ante using manufacturer specifications and documented in the PDD/PoA-DD.

[6] As per the WHO/UNICEF Joint Monitoring Programme for water supply and sanitation

B) provided at <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>. mutatis mutandis.

7. This methodology also refers to the latest approved versions of the following tools:

(a) "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";

(b) "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

(c) Tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period".

4. Definitions

8. The definitions contained in the Glossary of CDM terms shall apply.

9. Point of Use (POU). Devices treat only the water intended for direct consumption, typically at a single tap or limited number of taps, while Point of Entry (POE) treatment devices are typically installed to treat all water entering a single home, business, school, or facility (USEPA, 2006).

10. A distribution network supplying SDW (in compliance with provisions under paragraph 3(b)). It is a public service which is provided by government to people living within its jurisdiction, either directly or through an authorized party.

11. Water kiosk. It is a facility to treat water to be delivered or sold to final consumers in appropriate conditions of sealed storage and/or residual capacity of disinfection, in such a way as to prevent recontamination before the final consumption as drinking water.

5. Baseline methodology

5.1. Project boundary

12. The project boundary includes the physical, geographical sites of the low greenhouse gas emitting technologies for water purification installed by the project activity and the household/institutional buildings where the consumers of safe water provided by the systems are located.

5.2 Baseline emissions

13. For a simplified and standardized approach it is assumed that fossil fuel and/or non-renewable biomass (NRB) is used to boil water as means of water purification in the absence of the project activity. The emissions are calculated based on the energy demand for boiling water, and in case of displacement of NRB the baseline emissions are corrected for the fraction of the biomass that can be demonstrated to be non-renewable. Only purified water consumed for drinking purposes can be used in the baseline calculation.

14. The baseline emissions shall be calculated as follows:

$$BE_y = QPW_y \times m \times X_{boil} \times SEC \times \sum_i (BLfuel,i \times f_i \times EF_{projected_{fossilfuel,i}} \times 10^{-9}) \quad \text{Equation (1)}$$

Where:

BE_y	=	Baseline emissions during the year *y* in (t CO_2e)
QPW_y	=	Total quantity of purified water by the project in year *y* (L).
m	=	Fraction of functional appliances that are meeting the SDW standards (%)
X_{boil}	=	Fraction of the population served by the project activity for which the common practice of water purification is or would have been water boiling. For Case 1 as per paragraph 4(a) above, value to be applied is 1
SEC	=	Specific energy consumption required to boil one litre of water (kJ/L), to be calculated according to paragraph 18 or 19 below
$BLfuel,i$	=	Proportions of baseline fuel type i (NRB and/or fossil fuels) used in the absence of the project activity (%)
f_i	=	Fraction of fuel type i used in the absence of the project activity in year y. For biomass it is the fraction of woody biomass that can be established as non-renewable biomass (f_{NRB}). If the baseline fuel is fossil fuel, the value to be applied is 1.
$EF_{projected\_fossilfuel,i}$	=	Emission factor of the fuel type i substituted (t CO_2/TJ)

15. The quantity of purified water in a year is:

    (a) Directly monitored (see sec. 6.1, parameter table 10); or

    (b) Estimated following the procedures described in paragraph 16 below.

16. The quantity of purified water should be calculated based on the following options:

    (a) The capacity of the equipment based on the manufacturers' specifications, and the fraction of time the equipment is used, as follows:

$$QPWy = \sum q_{,i} \; x \; t \; x \; 365 \quad \text{Equation (2)}$$

Where:

q_i	=	Capacity of the water purification device (L/hour)
t	=	Usage fraction of time (hours/day)

    (b) the population serviced by the project activity and an average volume of drinking water per person per day, as follows:

$$QPWy = P\ x\ min\ (QPWpp\ ;\ 5.5\ )\ x\ 365$$ Equation (3)

Where:

P	=	Population serviced by the project activity
QPW_{pp}		Average volume of drinking water per person per day (L/person/day)

17. The quantity of purified water, whether it is monitored or calculated as per paragraphs 15 and 16, respectively, is subject to a cap that must be established based on the population (P) serviced by the project activity and the maximum quantity of drinking water per person per day of 5.5 L/person/day[7]. If the quantity of purified water by the project activity exceeds the established cap, emission reductions cannot be claimed for the quantity of purified water above the established cap.

18. Specific energy consumption required to boil one litre of water is to be calculated as follows:

$$SEC = \left[WH \times \left(T_f - T_i\right) + 0.01 \times WHE\right] / n_{wb}$$ Equation (4)

Where:

WH	=	Specific heat of water (kJ/L °C). Use a default value of 4.186 kJ/L °C
T_f	=	Final temperature (°C). Use a default value of 100 °C[8]
T_i	=	Initial temperature of water (°C). Use annual average ambient temperature;[9] or use a default value of 20 °C
WHE	=	Latent heat of water evaporation (kJ/L). Use a default value of 2260 kJ/L. The latent heat required to boil one litre of water for five minutes is assumed to be equivalent to latent heat for the evaporation of 1% of the water volume (WHO recommends a minimum duration of five minutes of water boiling)[10]
n_{wb}	=	Efficiency of the water boiling systems being replaced, estimated ex- ante using any of the default values given in paragraph 26, Data/Parameter table 4.

[7] Based on WHO recommendations (Domestic Water Quantity, Service Level and Health, Table 2: Volumes of water required for hydration, WHO 2003).

[8] Boiling point of water at standard conditions

[9] Ambient temperature data must be from globally accepted data sources, for example data published by the National Aeronautics and Space Administration (NASA) or the National Renewable Energy Laboratory (NREL). Data can be used only if they are for a location that can be demonstrated to be representative of the project location.

[10] WHO guidelines for emergency treatment of drinking water at point of the use <http://www.searo.who.int/LinkFiles/List_of_Guidelines_for_Health_Emergency_Emergency_treatment_of_drinking_water.pdf>.

19. Alternatively, if default values of the parameters are applicable to Equation (4) above, SEC can be calculated as follows:

$$SEC = [357.48\ kJ/L]\ /n_{wb}$$ Equation (5)

5.3. Leakage

20. Where relevant leakage relating to the non-renewable woody biomass shall be assessed as per the relevant procedures of AMS-I.E.

5.4. Project activity emissions

21. If the operation of the project water purification system involves consumption of fossil fuels and/or electricity, CO_2 emissions from on-site consumption of fossil fuels and electricity due to the project activity shall be accounted for as project emissions[11].

$$PE_y = PE_{FF,y} + PE_{EC,y}$$ Equation (6)

5.4.1. Emissions from fossil fuel combustion ($PE_{FF,y}$)

22. $PE_{FF,y}$ shall be calculated using the latest version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".

5.4.2. Emissions from electricity consumption ($PE_{EC,y}$)

23. $PE_{EC,y}$ shall be calculated using the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

5.5 Emission reductions

24. Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$ Equation (7)

Where:

ER_y	=	Emission reductions in year *y* (t CO_2e/yr)
BE_y	=	Baseline emissions in year *y* (t CO_2/yr)
PE_y	=	Project emissions in year *y* (t CO_2e/yr)
LE_y	=	Leakage emissions in year *y* (t CO_2e/yr)

5.6. Project activity under a programme of activities

25. The use of this methodology in a project activity under a programme of activities is legitimate if the leakage is estimated and accounted for as per the relevant provisions of AMS-I.E under the section for programme of activities.

[11] Calculations of the project emissions may also be limited to the quantity of purified water used for the baseline calculations as per paragraph 13

5.7. Data and parameters not monitored

26. In addition to the parameters listed in the tables below, the provisions on data and parameters not monitored in the tools referred to in this methodology apply.

Data / Parameter table 1.

Data / Parameter:	**P**
Data unit:	Number
Description:	Population serviced by the project activity
Source of data:	Estimated through surveys
Value to be applied:	
Any comment:	

Data / Parameter table 2.

Data / Parameter:	QPW_{pp}
Data unit:	Litres
Description:	Average volume of drinking water per person per day
Source of data:	Estimated through ex ante survey or official data, or peer reviewed literature or local expert opinion. Alternatively, a default value of 3 litres per person per day[12] can be used. The maximum value of 5.5 litres per person per day as noted in paragraph 17 above shall not be exceeded.
Value to be applied:	
Any comment:	-

Data / Parameter table 3.

Data / Parameter:	LS
Data unit:	Years
Description:	Life span of water treatment technologies
Source of data:	Manufacturer's specifications
Value to be applied:	
Any comment:	In cases where the life span of the water treatment technologies is shorter than the crediting period of the project activity, the project proponent shall ensure that the units are replaced in order to continue claiming emission reductions. There shall be measures in place to ensure that end users have access to replacement purification systems of comparable quality. These measures shall be documented in the PDD or PoA-DD.

[12] Based on WHO recommendations (Technical Notes on Drinking Water, Sanitation and Hygiene in Emergencies, Table 9.1: Simplified table of water requirements for survival (per person).

Data / Parameter table 4.

Data / Parameter:	n_{wb}
Data unit:	%
Description:	Efficiency of the water boiling systems being replaced
Source of data:	Project activity site
Value to be applied:	Use one of the options below: (a) The efficiency of the water boiling system shall be established using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than one type of systems are encountered; (b) 0.10 default value may be optionally used if the replaced system or the system that would have been used is a three stone fire or a conventional system for woody biomass lacking improved combustion air supply mechanism and flue gas ventilation system that is without a grate as well as a chimney; for the rest of the systems using woody biomass 0.2 default value may be optionally used; (c) 0.5 default value may be used if the replaced system or the system that would have been used is a fossil fuel combusting system
Any comment:	-

Data / Parameter table 5.

Data / Parameter:	$BLfuel,i$
Data unit:	%
Description:	Proportions of baseline fuel type i (NRB and fossil fuel).
Source of data:	Estimated ex ante through a survey or official data or peer reviewed literature or local expert opinion
Value to be applied:	-
Any comment:	-

Data / Parameter table 6.

Data / Parameter:	f_i
Data unit:	fraction
Description:	Factor to determine amount of non-renewable biomass.
Source of data:	Project activity site

Value to be applied:	Fraction of fuel type i used in the absence of the project activity in year y. For biomass it is the fraction of woody biomass that can be established as non-renewable biomass (fNRB) as per the relevant provisions of "AMS-I.E", i.e., using survey methods or government data or approved default country specific fraction of non-renewable woody biomass (f_{NRB}) values available on the CDM website[13]. If the baseline fuel is fossil fuel use a default value of 1.0.
Any comment:	-

Data / Parameter table 7.

Data / Parameter:	$EF_{projected\_fossilfuel,i}$
Data unit:	t CO2/TJ
Description:	Emission factor of the fuel(s) type i substituted
Source of data:	Project activity site
Value to be applied:	A value of 81.6 tCO2/TJ shall be applied when NRB is displaced as per AMS-I.E procedures. Use the emission factor of the fossil fuel when fuel substituted is fossil fuel ~~or a value of 81.6 tCO2/TJ when NRB is displaced as per AMS-I.E procedures.~~
Any comment:	-

Data / Parameter table 8.

Data / Parameter:	X_{boil}
Data unit:	%
Description:	Fraction of the population serviced by the project activity for which the common practice of water purification is or would have been water boiling
Source of data:	Established ex-ante through survey for case 2 of paragraph 4(b). For Case 1 of paragraph 4(b), value to be applied is 1.
Value to be applied:	
Any comment:	Applicable under the conditions described in paragraph 4(b) of this methodology.

Data / Parameter table 9.

Data / Parameter:	$q_{,i}$
Data unit:	Litres/hour
Description:	Capacity of the equipment type i
Source of data:	Project activity site
Value to be applied:	-
Any comment:	Based on the manufacturers' specifications

[13] Default values endorsed by designated national authorities and approved by the Board are available at <http://cdm.unfccc.int/DNA/fNRB/index.html>.

6. Monitoring methodology

27. All data collected as part of monitoring should be archived electronically and be kept at least for two years after the end of the last crediting period. One hundred per cent of the data should be monitored if not indicated otherwise in the tables below. All measurements should be conducted with calibrated measurement equipment according to relevant industry standards.

28. In addition, the monitoring provisions in the tools referred to in this methodology apply.

6.1. Data and parameters monitored

Data / Parameter table 10.

Data / Parameter:	QPW_y
Data unit:	Litres
Description:	Quantity of purified water in year y
Source of data	Records
Measurement procedures (if any):	The quantity of purified water in year y shall be determined as per the following options: (a) Monitoring on continuous basis using flow meter(s) for a statistically valid sample of the distributed appliances, or (b) Monitoring of a statistically valid sample of the distributed appliances during a period that is representative of the monitoring period. Alternatively, this parameter can be calculated, based on either Equation (2) or Equation (3) in paragraph 16 above.
Monitoring frequency:	Annual
QA/QC procedure	-
Any comment:	For (a) and (b), the sample size shall be determined as per the latest version of the "Standard: Sampling and surveys for CDM project activities and programme of activities" [14]

Data / Parameter table 11.

Data / Parameter:	m
Data unit:	fraction
Description:	Fraction of functional appliances that are meeting the SDW standards as per paragraph 3(b).
Source of data	Surveys

[14] <https://cdm.unfccc.int/Reference/Standards/index.html>.

Measurement procedures (if any):	Monitoring shall consist of checking of all appliances or a representative sample thereof, at least once every two years (biennial) to ensure that they are still operating or are replaced by an equivalent in service appliance.
Monitoring frequency:	At least once every two years (biennial)
QA/QC procedure	The sampling plan shall also include provisions to collect information for records of replacement of appliances, filters and maintenance.
Any comment:	A statistically valid sample of the appliances can be used to determine the parameter value, as per the relevant requirements for sampling in the "Standard for sampling and surveys for CDM project activities and programme of activities". • When biennial inspection is chosen, a 95% confidence interval and a 10% margin of error requirement shall be achieved for the sampling parameter. • When annual inspection is chosen, a 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters. • In cases where survey results indicate that 90/10 precision or 95/10 precision is not achieved, the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 or 95/10 precision.

Data / Parameter table 12.

Data / Parameter:	t
Data unit:	Hours/day
Description:	Usage fraction of time
Source of data	Surveys
Measurement procedures (if any):	Ex post monitoring survey to establish the fraction of time in a day when the water purification device is functional
Monitoring frequency:	At least once every two years (biennial)
QA/QC procedure	-
Any comment:	A statistically valid sample can be used to determine parameter values, as per the relevant requirements for sampling in the "Standard for sampling and surveys for CDM project activities and programme of activities". • When biennial inspection is chosen, a 95% confidence interval and a 10% margin of error requirement shall be achieved for the sampling parameter. • When annual inspection is chosen, a 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters.

	• In cases where survey results indicate that 90/10 precision or 95/10 precision is not achieved, the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 or 95/10 precision.

Data / Parameter table 13.

Data / Parameter:	**Installation of a SDW public distribution network**
Data unit:	-
Description:	Annual check if a SDW public distribution network is installed
Source of data	Surveys
Measurement procedures (if any):	Monitoring shall include annual check if a SDW public distribution network is installed.
Monitoring frequency:	Annual
QA/QC procedure	-
Any comment:	If SDW is made available through a public distribution network during the crediting period, the emission reductions pertaining to the households/buildings supplied by the public system cannot be claimed from that point onwards. This condition should be checked annually during the crediting period.

Data / Parameter table 14.

Data / Parameter:	**Quality of safe drinking water**
Data unit:	-
Description:	The quality of the safe drinking water
Source of data	Project activity site
Measurement procedures (if any):	The safe drinking water quality is monitored on sample basis at least once every two years (biennial)
Monitoring frequency:	At least once every two years
QA/QC procedure	-
Any comment:	Emission reductions cannot be claimed if project activity fails to meet SDW standards are as per paragraph 3(b).

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Document information

Version	*Date*	*Description*
05.0	3 July 2015	SSC WG 48, Annex 3 To be considered by the Board at EB85. This draft methodology was available for public input from 12 to 27 May 2015. Revision to: (a) Provide more specific guidance in applying the methodology including the calculation of baseline emissions to enable a standardized approach; and (b) Provide simplified and flexible monitoring procedures to reduce transaction costs without compromising environmental integrity.
04.0	31 May 2013	EB 73, Annex 12 The revision: Broadens the applicability of the methodology to water kiosks that treat water using one or more of the following technologies: chlorination, combined flocculant/disinfection powders and solar disinfection.
03.0	13 September 2012	EB 69, Annex 22 The revision: Includes project technologies that comply with WHO's Interim performance target on household water treatment or applicable national standards/guidelines.
02	15 July 2011	EB 62, Annex 1 The revision: (a) Includes guidance on the procedures for project equipment testing and monitoring provisions; (b) Increases the threshold of rural or urban population with access to improved drinking source to 60 per cent; and (c) Applies a cap of 5.5 litres per person per day to all project activities.
01	15 April 2011	EB 60, Annex 19 Initial adoption.

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