Monitoring report form for CDM project activity
(Version 06.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT	
Title of the project activity	West Nile Electrification Project (WNEP)
UNFCCC reference number of the project activity	0775
Version number of the PDD applicable to this monitoring report	6.0
Version number of this monitoring report	1.1
Completion date of this monitoring report	20/07/2018
Monitoring period number	5th
Duration of this monitoring period	01/01/2015 – 31/12/2017
Monitoring report number for this monitoring report	N/A
Project participants	**Uganda:** West Nile Rural Electrification Company Limited (WENRECo) **Sweden:** Government of Sweden – Swedish Energy Agency; **France:** GDF Suez **Japan:** Chubu Electric Power Co., Inc; Japan International Cooperation Agency; Kyushu Electric Power Co., Inc; Mitsubishi Corporation; Shikoku Electric Power Co., Inc; Tohoku Electric Power Co., Inc; The Tokyo Electric Power Co., Inc; The Chugoku Electric Power Co., Inc; Mitsui & Co.Ltd

	Netherlands: Electrabel S.A; Netherlands' Ministry of Infrastructure and the Environment (IenM); Netherlands' Ministry of Economic Affairs, Agriculture and Innovation (EL&I); **Norway:** Government of Norway – Ministry of Foreign Affairs; Norsk Hydro ASA; Statoil ASA United Kingdom of Great Britain and Northern Ireland: BP Alternative Energy International Ltd.; Deutsche Bank AG **Finland:** Fortum Corporation; Government of Finland – Ministry of Foreign Affairs and International Trade; **Germany:** RWE Power AG; Bilateral and Multilateral Funds: International Bank for Reconstruction and Development (IBRD) as Trustee of the Prototype Carbon Fund (PCF)	
Host Party	Uganda	
Sectoral scopes	Sectoral scope 1, Energy industries (renewable - / non-renewable sources)	
Applied methodologies and standardized baselines	AMS-I.A: Electricity generation by the user. Version 16.0.	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0	31,992
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	49,356	

SECTION A. Description of project activity

A.1. General description of project activity

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The overall objectives of the West Nile Electrification Project (WNEP) are to promote socio-economic development in rural Uganda and to reduce CO_2 emissions through generating clean energy by employing hydropower. The project activities include installation and operation of a 3.5 MW (2 units of 1.75 MW) hydroelectric power plant, which became operational in September 2012.

The project also upgrades and extends the distribution networks in Paidha, Nebbi, and Arua municipalities, in order to connect 4,000 additional customers, who would otherwise operate small, privately-owned generation facilities.

In essence, the proposed project activity will be contributing to the development of Uganda's indigenous renewable energy basis while meeting the growing demand for energy in the West Nile region. Energy supply from fossil fuels such as diesel and petrol is dominant in the project area and the isolated energy generation by private facilities is insufficient and unreliable, whereas hydroelectric power will reliably deliver electricity that will stimulate economic development locally while reducing both local air pollution problems and CO2 emissions contributing to global warming.

The 3.5 MW Hydro plant on Nyagak River has been put into operation since September 2012 and started generating emission reductions in October 2012. The fifth monitoring period covers from 01/01/2015 to 31/12/2017. The total emission reductions of 31,992 tCO2 are achieved during this monitoring period.

A.2. Location of project activity

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The West Nile Region borders to the west on the Democratic Republic of Congo and to the north on Sudan. It comprises the districts of Nebbi, Arua, Moyo and Adjumani. Arua has a population of 850,000, Nebbi 450,000, and Moyo and Adjumani 110,000. The proposed project activity covers both urban and peri-urban areas. The West Nile Region has the potential to become one of Uganda's more productive agricultural areas, but insufficient and unreliable electricity supply has seriously constrained regional development, particularly in the agro-processing areas (e.g. coffee processing, cotton ginning, tea processing, edible oil extraction and grain milling).

The hydroelectric plant with an installed capacity of 3.5 MW using the waters from the Nyagak River is located close to the Paidha village at coordinates +2.429053, +30.975695.

Figure 1 gives a schematic depiction of the West Nile region. It shows the three population centres Arua, Nebbi, and Paidha, the hydropower stations at Nyagak and Olewa, and the sub-transmission lines (dotted lines).

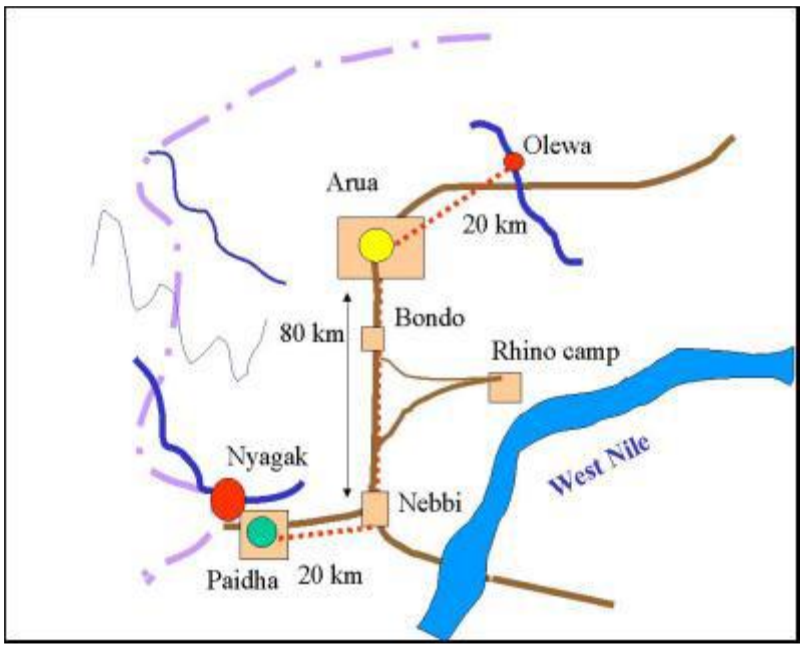

Figure 1: Schematic Representation of Original Proposal for West Nile Electric System

A.3. Parties and project participants

Uganda (host)	West Nile Rural Electrification Company Limited (WENRECo)	No
Sweden	• Government of Sweden – Swedish Energy Agency • International Bank for Reconstruction and Development (IBRD) as Trustee of the Prototype Carbon Fund (PCF)	Yes
France	GDF Suez	No
Japan	• Chubu Electric Power Co., Inc. • Japan International Cooperation Agency (JICA) • Kyushu Electric Power Co., Inc. • Mitsubishi Corporation • Shikoku Electric Power Co., Inc. • Tohoku Electric Power Co., Inc. • The Tokyo Electric Power Co., Inc. • The Chugoku Electric Power Co., Inc. • Mitsui & Co. Ltd.	No

Netherlands	• Electrabel S.A. • Netherlands' Ministry of Infrastructure and the Environment (IenM) • Netherlands' Ministry of Economic Affairs, Agriculture and Innovation (EL&I) • International Bank for Reconstruction and Development (IBRD) as Trustee of the Prototype Carbon Fund (PCF)	Yes
Norway	• Government of Norway – Ministry of Foreign Affairs • Norsk Hydro ASA • Statoil ASA	Yes
United Kingdom of Great Britain and Northern Ireland	• BP Alternative Energy International Ltd. • Deutsche Bank AG	No
Finland	• Fortum Corporation • Government of Finland – Ministry of Foreign Affairs	Yes
Germany	• RWE Power AG	No

A.4. Reference to applied methodologies and standardized baselines

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The approved methodology applied to the project activity is:
AMS-I.A: Electricity generation by the user. Version 16.0
https://cdm.unfccc.int/methodologies/DB/8FKZFJ7SG551TS2C4MPK78G12LSTW3

A.5. Crediting period type and duration

>>
7-year Renewable
1st crediting period: 01/01/2005 – 31/12/2011
2nd crediting period 01/01/2012 – 31/12/2018
The current monitoring period falls in the 2nd crediting period

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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The hydroelectric plant has an installed capacity of 2 x 1.75 MW (for a total rated discharge of 5.57 m^3/s and a gross head of 77.5 m) and will operate for a period of at least 25 years using the waters

of the Nyagak River. The hydroelectric plant includes a diversion weir and a run-of-river reservoir with live storage volume of 150,600 m^3 equivalent to 7.5 hours of storage, leading to a penstock and a powerhouse with transformers and switchgear. The estimated net power output of 20.56 GWh per year will be fed to the existing grid though a 33 kW over-head line.

The hydropower plant has been operating in line with requirements in the registered PDD of second crediting period since project commissioning. The net power generation of the project is 40,221 MWh and total operation time amounted to 38,077 hours during this monitoring period. During the fifth monitoring period, all the stops and downtimes have been recorded and taken into account in ER calculation and no ERs are claimed for the downtime.

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

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N/A

B.2.2. Corrections

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N/A

B.2.3. Changes to the start date of the crediting period

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N/A

B.2.4. Inclusion of monitoring plan

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N/A

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

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N/A

B.2.6. Changes to project design

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N/A

SECTION C. Description of monitoring system

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The monitoring plan conforms to the approved monitoring methodology for this project type stating as follows: The plant has two energy meters installed: one measures the gross energy generated by the units and the other is used to measure energy utilised by plant loads such as auxiliary equipment, lighting and computers.

The information from the meters is recorded daily at midnight and generation output and internal consumption for the day recorded. Other parameters necessary for the calculation of emission reductions is collected under the supervision of the Generation Superintendent.

The employees responsible for operation of the power plant are collecting information on a daily basis with QA/QC responsibility assigned to the Generation Superintendent. A routine by annual audit on the data is done by the overall QA/QC – Adnan Khalid for the project. The Generation

Superintendent checks the quality, consistency and comprehensiveness of the collected information on a daily basis. The information is recorded in both paper and electronic forms. The manager checks the data information.

The Overall QA/QC visits the site twice a year and does a random spot check on the data collected and the computed ER's – A QA/QC file is maintained on site.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

(Copy this table for each data or parameter.)

Data/parameter:	**EF_{CO2}**
Unit	tCO_2e/MWh
Description	CO_2 emission factor
Source of data	Default value from AMS-I.A version 16
Value(s) applied)	0.8
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	Component 1

Data/parameter:	**L**
Unit	-
Description	Average technical distribution losses that would have been observed in diesel powered mini-grids installed by public programmes or distribution companies in isolated areas, expressed as a fraction
Source of data	Default value from AMS-I.A version 16
Value(s) applied)	0
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions
Additional comments	Component 1 Refer to footnote 6 of AMS –I.A v16

Data/parameter:	**CAP_{BL}** (Component 1)
Unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero
Source of data	Default value from ACM0002 version 16
Value(s) applied)	0
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Component 1

Data/parameter:	A_{BL}
Unit	m^2
Description	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero
Source of data	Default from ACM0002 version 16
Value(s) applied)	0
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Component 1

D.2. Data and parameters monitored

(Copy this table for each data or parameter.)

Data / Parameter:	$EG_{i,y}$
Unit:	kWh
Description:	Annual output (net exported amount) of the hydropower plant
Measured/ Calculated / Default:	Calculated
Source of data:	Plant register
Value(s) of monitored parameter:	39,990,676
Monitoring equipment:	Two electricity meters are installed, one which measures gross generation and the other gross consumption. $EG_{i,y}$ is calculated as the net value of these two measurements.
Measuring/ Reading/ Recording frequency:	Continuous monitoring, at least hourly measurement, at least monthly recording
Calculation method (if applicable):	The net electricity is the gross energy generation by the project activity power plant minus the auxiliary / station electricity consumption. $\mathbf{EG_{i,y} = EG_{GROSS,y} - EC_{AUX}}$
QA/QC procedures:	Meter calibration is conducted as per manufacturer specifications, national standards, or international guidelines as appropriate, at least every third year.
Purpose of data:	Calculation of baseline emissions
Additional comment:	Archived on paper and electronic version until 2 years after end of crediting period.

Data / Parameter:	$EG_{GROSS,y}$
Unit:	kWh

Description:	Gross energy generation of the project activity
Measured/ Calculated / Default:	Measured
Source of data:	Plant register
Value(s) of monitored parameter:	40,211,224
Monitoring equipment:	One electricity meter is installed to measure gross electricity generated. Meter Type: Lovato DMK32, SNo: 00190719, Class 1, Date of last calibration: 04/09/2012, Meter to be verified for accuracy every 3 years, Validity: 03/09/2015
Measuring/ Reading/ Recording frequency:	Continuous monitoring, at least hourly measurement, at least monthly recording
Calculation method (if applicable):	N/A
QA/QC procedures:	Meter calibration will be conducted as per manufacturer specifications, national standards, or international guidelines as appropriate, at least every third year.
Purpose of data:	Calculation of baseline emissions
Additional comment:	Archived on paper and electronic version until 2 years after end of crediting period.

Data / Parameter:	**EC_{AUX}**
Unit:	kWh
Description:	Auxiliary electricity consumption of the project activity
Measured/ Calculated / Default:	Measured
Source of data:	Plant register
Value(s) of monitored parameter:	254,892
Monitoring equipment:	One electricity meter is installed to measure the auxiliary electricity consumption. One electricity meter is installed to measure the auxiliary electricity consumption. Meter Type: Lovato DMK32, SN: 00190721, Class 1. Date of last calibration: 04/09/2012, the meter accuracy to be verified every 3 years Validity:03/09/2015
Measuring/ Reading/ Recording frequency:	Continuous monitoring, at least hourly measurement, at least monthly recording
Calculation method (if applicable):	N/A
QA/QC procedures:	Meter calibration will be conducted as per manufacturer specifications, national standards, or international guidelines as appropriate, at least every third year.

Purpose of data:	Calculation of baseline emissions
Additional comment:	Archived on paper and electronic version until 2 years after end of crediting period.

Data / Parameter:	**CAP_{PJ}**
Unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Measured/ Calculated / Default:	Default
Source of data:	Determined the installed capacity based on recognized standards
Value(s) of monitored parameter:	3,500,000
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	N/A
QA/QC procedures:	-
Purpose of data:	Calculation of project emissions
Additional comment:	Component 1

Data / Parameter:	**A_{PJ}**
Unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Measured/ Calculated / Default:	Measured
Source of data:	Project site
Value(s) of monitored parameter:	61,079
Monitoring equipment:	The area is measured from 2015 satellite picture of google earth and calculated by AutoCAD.
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	Automatically calculated by engineering program of AutoCAD. Spill level of 1,443m with perimeter 2,315 m
QA/QC procedures:	-
Purpose of data:	Calculation of project emissions
Additional comment:	Component 1

D.3. Implementation of sampling plan

>>
N/A

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

>>
According to the approved methodology AMS-I.A, the energy baseline is the fuel consumption of the technology in use or that would have been used in the absence of the project activity to generate the equivalent quantity of energy. Since it is possible to monitor annual electricity generation from project renewable energy technologies in this case, Option 2 is selected for baseline emissions calculation.

The energy baseline is calculated as follows:
$E_{BL,y} = \Sigma i\ EG_{i,y} / (1 - l)$

Where:
$E_{BL,y}$ = Annual energy baseline; kWh
Σi = The sum over the group of i renewable energy technologies (e.g. renewable energy technologies for solar home systems, solar pumps) implemented as part of the project activity
$EG_{i,y}$ = Annual output of the renewable energy technologies of the group of i renewable energy technologies installed; kWh
l = Average technical distribution losses that would have been observed in diesel powered mini-grids installed by public programs or distribution companies in isolated areas, expressed as a fraction. It is fixed ex ante in the PDD to be zero.

Since parameter l was fixed ex ante to be zero, therefore:

$E_{BL,y} = \Sigma i\ EG_{i,y}$

For Option 2, the emissions baseline is the energy baseline calculated in accordance with para. 8(b) times a default emission factor:

$BE_{CO2,y} = E_{BL,y} * EF_{CO2}$

Where:
$BE_{CO2,y}$ = Emissions in the baseline in year y; tCO2
$E_{BL,y}$ = Annual energy baseline; kWh
EF_{CO2}= CO2 emission factor; tCO2/kWh; AMS-I.A. default value of 0.8 kgCO2e/kWh

Parameter	Value
EGi,y (KWh)	39,990,676
EBL,y (KWh)	39,990,676
EF_{CO2}($kgCO_2e$/ KWh)	0.8

Baseline emissions are calculated as $\mathbf{BE_{CO2,y}}$= 39,990,676* 0.8/1000 = 31,992 tCO_2

Table 1: Monthly Baseline emissions generated during the third monitoring period

Month	Baseline Emissions (tCO2)
January 2015	724.3
February 2015	643.0
March 2015	779.0
April 2015	729.1
May 2015	763.0
June 2015	742.2
July 2015	789.8
August 2015	784.9
September 2015	762.0
October 2015	657.3
November 2015	820.5
December 2015	923.0
January 2016	1,086.2
February 2016	968.6
March 2016	953.5
April 2016	940.7
May 2016	749.3
June 2016	760.6
July 2016	1,034.8
August 2016	997.3
September 2016	977.6
October 2016	1,050.9
November 2016	1,158.8
December 2016	1,017.7
January 2017	679.5
February 2017	287.2
March 2017	795.1
April 2017	729.5
May 2017	711.5
June 2017	1,001.5
July 2017	991.6
August 2017	1,139.6
September 2017	1,056.1
October 2017	1,212.7
November 2017	1,252.4
December 2017	1,321.6
Total	**31,992 (rounded down)**

E.2. Calculation of project emissions or actual net removals

>>

According to AMS-I.A, para.13 “For most renewable energy project activities, PEy = 0. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002. -Emissions related to the operation of geothermal power plants (e.g. non- condensable gases, electricity/fossil fuel consumption); -Emissions from water reservoirs of hydro power plants.”

The project is a run-of-river hydropower plant and entails a run-of-river reservoir. According to ACM0002, “Grid-connected electricity generation from renewable sources” Version 16.0, para.42, for hydro power project activities that result in new single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH4 and CO2 emissions from the reservoirs.

If the power density of the project activity (*PD*) is greater than 10 W/m2:
$PEy = PE_{HP,y} = 0$

Para. 41 states that the power density of the project activity (PD) is calculated as follows:
$PD = (CAP_{PJ} – CAP_{BL}) / (A_{PJ} – A_{BL})$
Where:
PD Power density of the project activity (W/m2)
CAP_{PJ} :Installed capacity of the hydro power plant after the implementation of the project activity (W)
CAP_{BL}: Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero
A_{PJ}: Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m2)
A_{BL}: Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m2). For new reservoirs, this value is zero

$PD = (CAP_{PJ} – CAP_{BL}) / (A_{PJ} – A_{BL})$
$= (3{,}500{,}000 – 0) / (61{,}079 – 0)$
$= 57.3\ W/m^2$

Since the power density of the project activity, PD = 57.3 W/m^2 is greater than 10 MW/m^2, thus:

$PE_{HP,y} = PE_y = 0$

E.3. Calculation of leakage emissions

>>

Following methodology AMS-I.A version 16: Given that the hydroelectric plant is not transferred from another activity, the possibility of leakage can be ignored.
LE = 0

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	31,992	0	0	0	31,992	31,992

Table 2. Monthly ER calculation

Month	BEy (tCO2)	PEy (tCO2)	LEy (tCO2)	ERy (tCO2)
Jan-15	724.3	-	-	724.3
Feb-15	643.0	-	-	643.0
Mar-15	779.0	-	-	779.0
Apr-15	729.1	-	-	729.1
May-15	763.0	-	-	763.0
Jun-15	742.2	-	-	742.2
Jul-15	789.8	-	-	789.8
Aug-15	784.9	-	-	784.9
Sep-15	762.0	-	-	762.0
Oct-15	657.3	-	-	657.3
Nov-15	820.5	-	-	820.5
Dec-15	923.0	-	-	923.0
Jan-16	1,086.2	-	-	1,086.2
Feb-16	968.6	-	-	968.6
Mar-16	953.5	-	-	953.5
Apr-16	940.7	-	-	940.7
May-16	749.3	-	-	749.3
Jun-16	760.6	-	-	760.6
Jul-16	1,034.8	-	-	1,034.8
Aug-16	997.3	-	-	997.3
Sep-16	977.6	-	-	977.6
Oct-16	1,050.9	-	-	1,050.9
Nov-16	1,158.8	-	-	1,158.8
Dec-16	1,017.7	-	-	1,017.7
Jan-17	679.5	-	-	679.5
Feb-17	287.2	-	-	287.2
Mar-17	795.1	-	-	795.1
Apr-17	729.5	-	-	729.5
May-17	711.5	-	-	711.5
Jun-17	1,001.5	-	-	1,001.5
Jul-17	991.6	-	-	991.6
Aug-17	1,139.6	-	-	1,139.6
Sep-17	1,056.1	-	-	1,056.1
Oct-17	1,212.7	-	-	1,212.7
Nov-17	1,252.4	-	-	1,252.4
Dec-17	1,321.6	-	-	1,321.6
Total	**31,992**			**31,992**

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante (t CO_2e)
31,992	49,356

E.6. Remarks on increase in achieved emission reductions

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The actual value of emission reductions achieved during the monitoring period of 01/01/2015 – 31/12/2017 is lower than the estimated value in registered PDD

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Document information

Version	*Date*	*Description*
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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