Monitoring report form (Version 03.2)

Monitoring report

Title of the project activity	Ishasha 6.6 MW Small Hydropower Project
Reference number of the project activity	6381
Version number of the monitoring report	01
Completion date of the monitoring report	27/02/2014
Registration date of the project activity	08/06/2012
Monitoring period number and duration of this monitoring period	First Monitoring Period 01/07/2012 to 31/10/2013 (Both days included)
Project participant(s)	1. Eco Power Uganda Ltd 2. C-Quest Capital LLC
Host Party(ies)	Uganda
Sectoral scope(s) and applied methodology(ies)	Sectoral Scope 1: Energy industries (renewable - / non-renewable sources) Applied Methodology: AMS-I.D, version 17, "Grid connected renewable electricity generation"
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	26,232
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	26,489
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)	9,865
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).	16,624

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

Purpose of the project activity and the measures taken for GHG emission reductions or net anthropogenic GHG removals by sinks

Ishasha Small Hydropower project is a 6.6 MW run-of-river hydropower plant located on Ishasha River, Kanungu district of Western Uganda (hereafter referred to as "the project"). The electricity generated will be transmitted to the Uganda Electricity Transmission Company Limited (UETCL), which operates the national grid system.

The project results in a reduction of anthropogenic emissions of greenhouse gas by displacing an equivalent volume of electricity that would otherwise be generated by the fuel-fired power plants tied to the national grid.

Brief description of the installed technology and equipment

The project involves installation of a run-of-river hydropower plant system and the installed capacity is 6.6 MW. 6.6 MW is the plant design (electrical) capacity resulting from the coupling of two (2) "Francis" turbines each with a nameplate capacity of 3.4 MW and two (2) Leroy Somer synchronous generators, each rated at 4.0 MVA and operated at power factor of 0.825.

The project will harness water from the Ishasha River and deposit the water approximately 90 metres through a mild steel penstock of 1,140 metres to run two turbines located in a power house at the end of the penstock. The runoff water tailrace is channelled for a re-entry into the Ishasha River at a point less than 1.5 kilometres from the dam/weir location.

Relevant dates for the project activity

Event	Date
Start date of project activity	28/12/2008
Start date of plant operation	06/03/2011
Registration of project activity	08/06/2012
1st monitoring period	01/07/2012 – 31/10/2013

Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period

The project results in a total emission reduction of 26,489 tCO_2e over the monitoring period of 01 July 2012 to 31 October 2013.

A.2. Location of project activity

a) Host Party(ies): Republic of Uganda

b) Region/ State/ Province: Kanungu District of South-Western Uganda

c) City/ Town/ Community: Ruheza-Kyajura Village, Nyamigoue Parish in Kanyantoorogo sub-county

d) Physical/ Geographical location:

Location	Coordinates
Weir/Diversion Intake	-0.935556, 29.668611
Power House/Tailrace	-0.878611, 29.657500

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Uganda (Host)	Eco Power Uganda Ltd	No
The Netherlands	C-Quest Capital LLC	No

A.4. Reference of applied methodology

Applied Methodology: AMS-I.D. "Grid connected renewable electricity generation" (Version 17)

http://cdm.unfccc.int/UserManagement/FileStorage/V9LRSXKP24Q7YT6HZDUBO3C0ING8AJ

Methodological Tool: "Tool to calculate the emission factor for an electricity system" (Version 02.2.1)

http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

A.5. Crediting period of project activity

Fixed crediting period from 1 July 2012 to 30 June 2022 (10 years, 0 month)

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

The implementation of the project consists of construction of the following main items:

- A dam/diversion weir which rises 15 meters above the water level in the Ishasha River to allow sufficient water storage of about 44,000 cubic meters to operate the plant at full capacity approximately for 2 hours.
- Intake Structure
- A 1,140 meters in length penstock laid along the ground on concrete supports or buried in some areas from the intake to the power house
- A power house with a floor area of approximately 200 m^2
- A power house with two horizontal 3.4 MW Francis turbines each coupled to a 4.0 MVA synchronous generator operated at a power factor of 0.825 to produce the plant design electrical capacity of 6.6 MW.
- A tailrace canal and related structures back to the Ishasha River
- A transformer station and a 7 km 33kV transmission line
- Access roads
- Staff quarters

The project was implemented and operated in accordance with the registered PDD. The project consists of one site only and the implementation is not phased. The project started the operation on 6 March 2011. During the monitoring period, the project activity was in normal operation. There was no events or situations occurred which may impact the applicability of the methodology.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

There are no temporary deviations in the monitoring plan.

B.2.2. Corrections

No corrections have been made in this monitoring period.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

The monitoring plan in respect of the project activity or the applied methodology has not undergone any permanent changes since registration.

B.2.4. Changes to project design of registered project activity

There are no changes to project design of registered project activity.

B.2.5. Changes to start date of crediting period

There is no change in start date of crediting period.

B.2.6. Types of changes specific to afforestation or reforestation project activity

Not applicable.

SECTION C. Description of monitoring system

Data collection procedures and metering

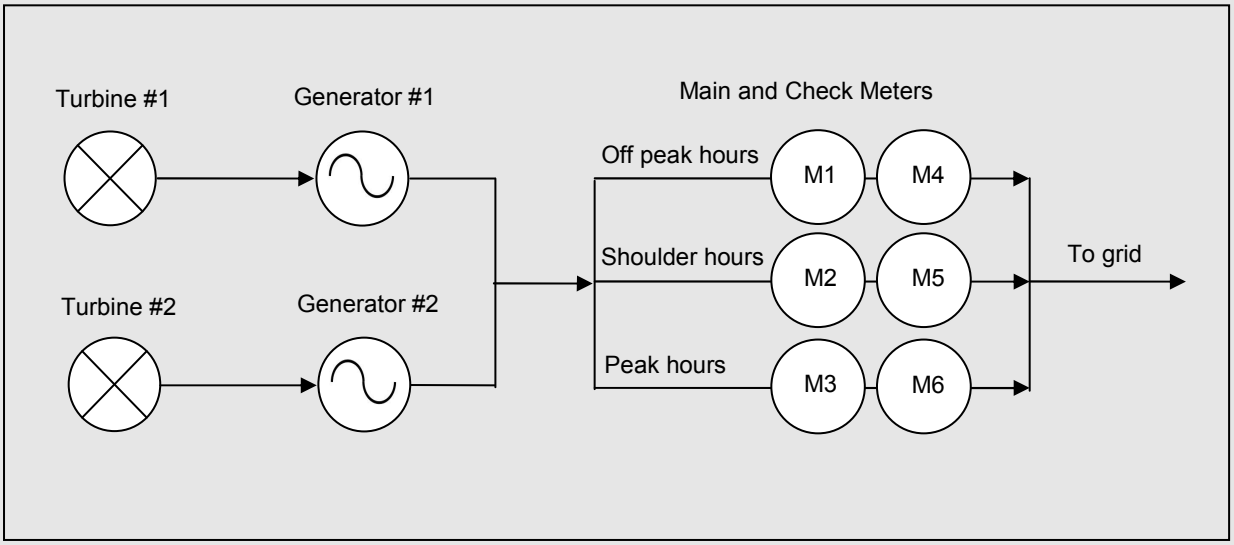
Electricity generation data is the main input variable for the calculation of emission reductions and it is monitored via metering approach. Eco Power Uganda Ltd (EPUL) is responsible to meter in the dual meter system. There is only one line and the dual meter is two-way hourly meter, so each meter reading is a net reading of power exported from or imported to the power station. There will always be a back-up meter in service in case of a main meter failure. The monthly net power supply to the grid will hence be the sum of all monthly meter readings.

The Main Meter (Meter M_1, M_2, M_3) and the Check Meter (Meter M_4, M_5, M_6) system installed, owned and maintained by EPUL, is designed such that the overall measurement system error (including instrument transformers, wiring, and metering instruments) shall be no greater than 0.2% (special UETCL requirement). The metering system shall provide 3 separate meter readings based on the supply period defined below:

Supply Period	Hours
Off peak hours	0000 to 0600 hours
Shoulder hours	0600 to 1800 hours
Peak hours	1800 to 2400 hours

The Main and Check Meters specified in the PPA shall be installed in a metering and control chamber to be provided by EPUL in a mutually agreed position as shall be agreed upon by the Parties as soon as it is practically possible and the said Meters shall be sealed by each Party using their own seals. Sealing and breaking of the seals shall be witnessed by a representative of each of the Parties.

The line diagram below shows the metering points for the project.



Organizational structure, roles and responsibilities

A Project Manager is appointed to be responsible for the overall monitoring system and reporting of all relevant issues which occurred in the monitoring activities. An Operational Manager is assigned to assist the Project Manager for the monitoring of monthly electricity generation and liaise with the electricity purchaser, UETCL, to correct any discrepancies of measurement according to the requirements and direction of the Power Purchase Agreement (PPA).

The Operational Manager will report to the Project Manager and coordinate with UETCL on a monthly basis, and the figures confirmed by both as accurate will be used for reporting emission reductions.

Emergency procedures for the monitoring system

If there is any failure of the meters, the site technician will notify the grid company and CDM manager.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data / Parameter:	$EF_{CO2,grid,y}$
Unit:	t CO_2/MWh
Description:	CO_2 emission factor of the grid
Source of data:	Registered PDD
Value(s) applied):	0.6673
Purpose of data:	Baseline emission calculations
Additional comment:	-

Data / Parameter:	Cap_{BL}
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:	Project site
Value(s) applied):	0
Purpose of data:	Project emission calculations
Additional comment:	-

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:	Project site
Value(s) applied):	0
Purpose of data:	Project emission calculations
Additional comment:	-

D.2. Data and parameters monitored

Data / Parameter:	EG_y
Unit:	MWh
Description:	Quantity of net electricity supplied to the grid
Measured/ Calculated / Default:	Measured
Source of data:	1) Monthly invoices issued by EPUL to UETCL for the electricity sales invoicing and payment.[1] 2) Monthly reports of manual meter reading by UETCL.[2]
Value(s) of monitored parameter:	39,696.12
Monitoring equipment:	The data has been measured continuously using meter and recorded on a monthly basis from the monthly invoices.
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	-
QA/QC procedures:	There will always be a back-up meter in service in case of a main meter failure. The monthly net power supply to the grid will hence be the sum of all monthly meter readings.
Purpose of data:	Baseline emission calculations
Additional comment:	-

[1] The value of meter reading indicated in the invoices is the **net electricity supplied** (export minus import) to the grid.
[2] The report provides the present readings of monthly electricity generation and consumption.

Data / Parameter:	Cap_{PJ}
Unit:	MW
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Measured/ Calculated / Default:	Calculated
Source of data:	EPUL
Value(s) of monitored parameter:	6.6
Monitoring equipment:	Determine the installed capacity based on recognized standards
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	-
QA/QC procedures:	-
Purpose of data:	Project emission calculations
Additional comment:	-

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:	EPUL
Value(s) of monitored parameter:	9,608
Monitoring equipment:	Measured from topographical surveys, maps, satellite pictures, etc.
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	-
QA/QC procedures:	-
Purpose of data:	Project emission calculations
Additional comment:	-

Environmental and Social impacts

These parameters have no impact on emission reduction calculation and have been monitored in-line with the registered PDD.

The main environmental concern required EPUL always allow 250 litres (0.25 m^3) per second of river water to pass through an open pipe at the bottom of the dam such that there will always be an adequate flow of water in the section of the river between the diversion and the tailrace, especially during the dry season.

As observed in Environmental Audit Report, the environmental flow pipes of required dimensions had been installed into the dam infrastructure and it allows a release of 0.250 m^3 of water to the river all the time. To avoiding any situation where the flow will be reduced during dry spells, five pressures values have been installed just above the environmental flow pipe. This will enable the plant operator to maintain the required volume of free environmental flow by turning on the pressure values.

For the social impacts, a positive aspect of the project is through employment of local people. Below are the employment details as on December 2012 and October 2013.

	Dec-12	Oct-13
Employee category	**Number of Employees**	
Engineer	1	1
Liaison Officer	1	1
Power House Operator	2	2
Power House Assistant	6	6
Accounts	1	1
Technical Officer	2	1
Total	**13**	**12**

D.3. Implementation of sampling plan

No sampling is involved.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

The baseline emissions are calculated as per formula below.

$$BE_y = EG_y \times EF_{CO2,\ grid}$$

Where:

BE_y	Baseline Emissions in year *y* (t CO2)
EG_y	Quantity of net electricity supplied to the grid (MWh)
$EF_{CO2,\ grid}$	CO2 emission factor of the grid (t CO2/MWh)

Quantity of net electricity supplied to the grid

		Quantity of net electricity supplied to the grid according to the supply period (kWh)			Total net electricity supplied to the grid (kWh)
Inv #	**Month**	**Peak hours**	**Shoulder hours**	**Off Peak hours**	
Year 2012					
July/2012/007	Jul-12	526,620	915,250	463,910	**1,905,780**
Aug/2012/008	Aug-12	580,150	784,130	331,090	**1,695,370**
Sep/2012/009	Sep-12	734,940	1,274,670	694,670	**2,704,280**
Oct/2012/010	Oct-12	763,750	1,257,040	684,410	**2,705,200**
Nov/2012/011	Nov-12	835,950	1,127,300	801,410	**2,764,660**
Dec/2012/012	Dec-12	850,710	1,344,860	812,390	**3,007,960**
Year 2013					
Jan/2013/001	Jan-13	857,580	1,299,680	659,360	**2,816,620**
Feb/2013/002	Feb-13	820,620	1,333,710	501,170	**2,655,500**
Mar/2013/003	Mar-13	873,070	1,416,470	534,580	**2,824,120**
Apr/2013/004	Apr-13	864,710	1,433,280	800,660	**3,098,650**
May/2013/005	May-13	852,170	1,509,560	707,360	**3,069,090**
June/2013/006	Jun-13	735,320	1,158,410	455,220	**2,348,950**
July/2013/007	Jul-13	706,280	991,660	344,240	**2,042,180**
Aug/2013/008	Aug-13	638,830	889,190	235,040	**1,763,060**
Sep/2013/009	Sep-13	672,600	617,970	562,080	**1,852,650**
Oct/2013/010	Oct-13	815,660	931,140	695,250	**2,442,050**
Total		**12,128,960**	**18,284,320**	**9,282,840**	**39,696,120**

The ex-ante grid emission factor as per the registered PDD is 0.6673 t CO_2/MWh.

EG_y = 39,696,120/1000 = 39,696.12 MWh

BE_y = 39,696.12 x 0.6673

= **26,489 tCO_2e** (after rounded down)

E.2. Calculation of project emissions or actual net GHG removals by sinks

As per AMS I.D. ver 17, the project emissions from water reservoirs of hydro power plants have to be considered following the procedure described in the most recent version of ACM0002.

If the power density of the project activity (*PD*) is greater than 10 W/m^2, PE = 0

The power density of the project activity (*PD*) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:

PD	=	Power density of the project activity (W/m^2)
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 (m^2)
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 (m^2). For new reservoirs, this value is zero

$$PD = \frac{(6.6 - 0)\ MW}{(9608 - 0)\ m^2}$$

$$= 686.93\ W/m^2$$

The power density of the project activity (*PD*) is greater than 10 W/m^2, therefore the project emission can be ignored.

Thus, PE= 0

E.3. Calculation of leakage

There are no leakage emissions associated

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO_2e)
Total	26,489	0	0	26,489

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	26,232 (Estimated annual emission reductions is 19,621 tCO_2e)	26,489

Ex-ante estimates of emission reductions for year 2012 as per registered PDD

- Period monitored in 2012: 1 Jul 2012 – 31 Dec 2012
- ERs estimated as per the registered PDD = **9,891 tCO_2**

Ex-ante estimates of emission reductions for year 2013 as per registered PDD

- Period monitored in 2013: 1 Jan 2013 – 31 Oct 2013 = 304 days
- ERs estimated for year 2013= 19,621 tCO_2
- ERs/day for 2013= 19,621/365 = 53.75 tCO2 /day
- ERs estimated as per the registered PDD (1 Jan 2013 – 31 Oct 2013) = 304 x 53.75
  = **16,341,87 tCO_2**

Ex-ante estimates of emission reductions for the whole Monitoring Period (1 Jul 2012 – 31 Oct 2013) as per registered PDD

- **ERs = 9,891 tCO_2 + 16,341.87 tCO_2**
  = 26,232.87
  = 26,232 tCO_2 (rounded down)

E.6. Remarks on difference from estimated value in registered PDD

There is a minor increase (1%) of emission reductions achieved in the monitoring period against the estimation in the registered PDD.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO_2e)	9,865	16,624

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Document information

Version	*Date*	*Description*
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 anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, 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	28 May 2010	EB 54, Annex 34. Initial adoption.

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