Monitoring report form (Version 03.2)

Monitoring report

Title of the project activity	Bujagali Hydropower Project
Reference number of the project activity	4217
Version number of the monitoring report	0.1
Completion date of the monitoring report	13/11/2013
Registration date of the project activity	07/10/2011
Monitoring period number and duration of this monitoring period	First Monitoring Period: 01/12/2011 - 31/10/2013
Project participant(s)	Bujagali Energy Limited, Government of Uganda Ministry of Energy and Mineral Development
Host Party(ies)	Uganda
Sectoral scope(s) and applied methodology(ies)	ACM0002
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	1,648,162 metric tonnes CO_2 equivalent
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	1,400,523 metric tonnes CO_2 equivalent
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)	636,943 metric tonnes CO_2 equivalent
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).	763,580 metric tonnes CO_2 equivalent

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The Bujagali Hydropower Project ("the Project" or "Bujagali")1 started generating renewable electricity for the Republic of Uganda and the region in December 2011. The project is capable of supplying approximately 1,305 GWh per year to the local electricity grid, representing the third largest hydroelectric energy source in Uganda. The Project falls under Sectoral Category number 1: Energy Industries (renewable/ non-renewable), as the activity is grid-connected electricity generation from a renewable source.

The Project sponsor is Bujagali Energy Limited ("BEL"), a project-specific company owned by affiliates of Sithe Global Power, LLC and the Aga Khan Fund for Economic Development ("AKFED"). Project planning began in 2004 when the GOU launced a Request for Proposals/ Prospects for the Development of the Bujagali Hydropower Project. Project authorization was received in 2007 when project lenders and guarantors approved funding. Construction was contracted to the Italian film Salini, who began the works in December 2007. The first unit became operations in February 2012, with an additional unit become operational for each of the next four months. Commissioning took place in July 2012. Commercial Operation began in August 2012.

The hydropower facility consists of a 28 m high earth-filled dam and spillway works, and an associated power station housing five 50 MW turbines. It is located at Dumbbell Island, approximately 8 km downstream (i.e. north) of the Town of Jinja. The dam impounds a reservoir that extends upstream to the tailrace area of the Nalubaale and Kiira facilities, inundating Bujagali Falls. The reservoir is 388 ha in surface area, comprised of the existing 308 ha surface of the Victoria Nile river, and 80 ha of newly inundated land. The amount of newly inundated land is small, as the reservoir waters are contained within the steeply incised banks of the river. In total the Project required a land-take of 125 ha for newly inundated land and permanent facilities.

Figure 1 shows the layout of the Project.

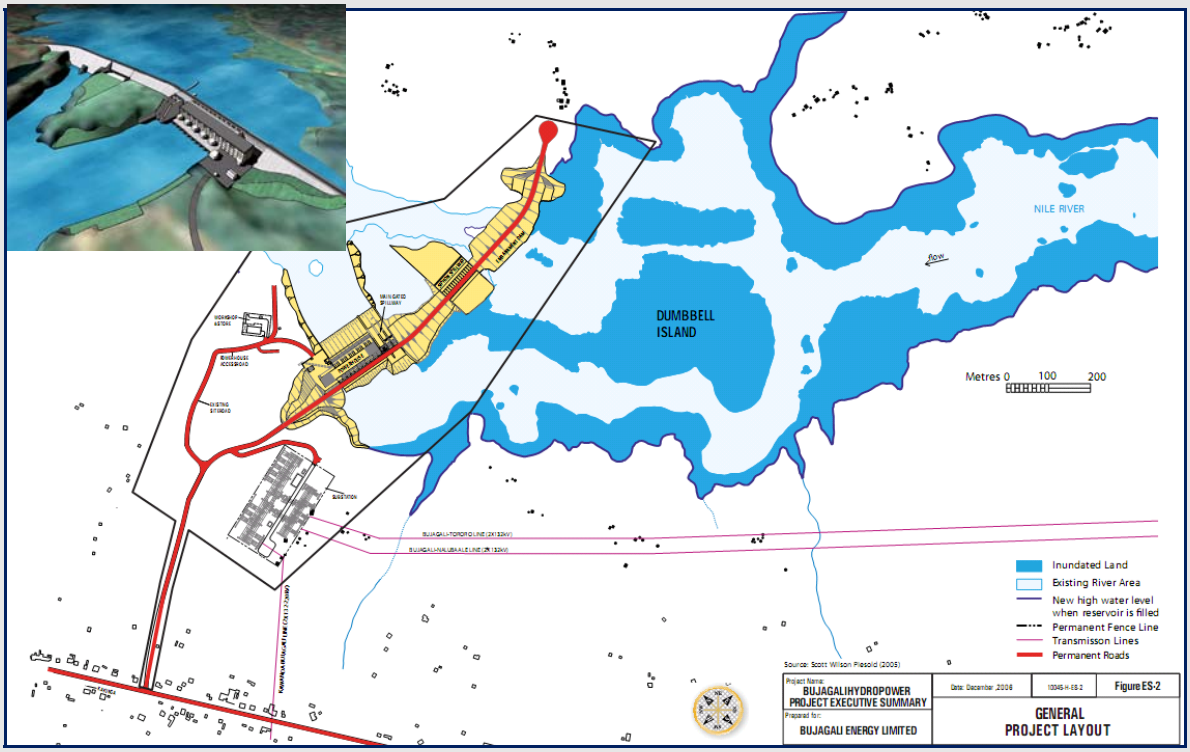

Figure 1. Layout of the Bujagali hydropower project.

In order to connect the Hydropower Plant ("HPP") to the national electrical grid, Uganda Electricity Transmission Company Limited ("UETCL") developed the Bujagali Interconnection Project ("IP"). The IP was constructed and is owned and operated by UETCL.

[1] www.bujagali-energy.com

All power from the Project is destined for the national grid and flows through a high voltage substation, which is located on the west bank of the river. The generator transformers increase the voltage from 9.5 kV to 132 kV for entry into the onsite Bujagali Substation which is connect to the Ugandan high voltage electric grid. New transmission lines (approximately 100 km total length) provide improved transmission capacity between Eastern Uganda and Kampala. The new transmission upgrades operate currently at 132 kV. An extension of this line to 220 kV to support a future planned regional transmission network is pending construction.

The scenario existing prior to the implementation of the project was the operation of grid connected power plants consisting of fossil fuel based plants (150 MW) and renewable plants (412 MW), used to determine the Emission Factor as per the PDD and included in this report in Section E1. The Bujagali hydro plant is a Greenfield Project therefore no equipment and/or facility existed prior to the project implementation. The Project reduces CO_2 emissions that in the absence of the project activity would have been generated through a combination of grid connected power plants, which to a large extent is based on diesel and heavy fuel oil generators that emit considerable volumes of CO_2.

While upstream reservoirs of hydro plants can sometimes be a source of CH4 emissions, given the plant's power density of 64 W/m2, such emissions are not relevant to the project as illustrated in Section D2.

The total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period are 1,400,523 metric tonnes CO_2 equivalent

A.2. Location of project activity

Host Party: Republic of Uganda
Region/State/Province: Eastern Region, Jinja District
City/Town/Community: Jinja

The project is located on the Victoria Nile in the Republic of Uganda, close to city of Jinja, the second largest city in Uganda. The Project site is located on the Victoria Nile River 8 km downstream of the Nalubaale and Kiira hydroelectric plants.

Within the Project area, the river varies in width between 200m and 600m and slopes downwards as it surpasses the nearby Dumbbell Island. The geographical coordinates are 0.501322" N and 33.13895E.

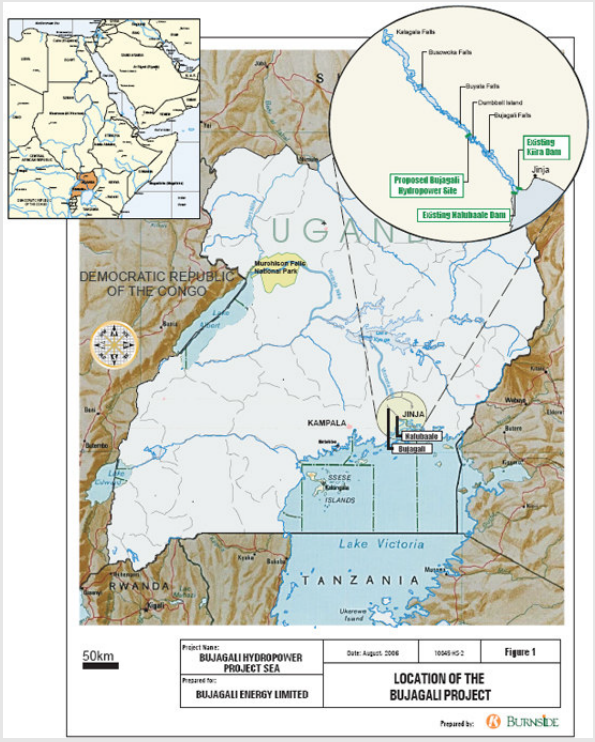

Figure 2 Map of the Project location

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)
Republic of Uganda (host)	Bujagali Energy Limited (Private) Government of Uganda, Ministry of Energy and Mineral Development (Public)	Yes
The Netherlands	Bujagali Energy Limited (Private)	No

A.4. Reference of applied methodology

The Project PDD followed methodology and related methodological tools:

- ACM0002, Consolidated methodology for grid-connected electricity generation from renewable sources --- Version 12;
- Tool for the demonstration and assessment of additionality --- Version 5.2;
- Tool to calculate the emission factor for an electricity system --- Version 02;

A.5. Crediting period of project activity

This is the first crediting period, valid from December 1, 2011 – November 30, 2018. The type of crediting period is renewable and the length is 3 x 7 years.

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

The hydropower facility uses water from the Victoria Nile River to generate electricity through five vertical turbine generator units with an installed capacity of 50 MW each and total design flow of 1375 m^3/s. The technical details of the Bujagali hydropower plant are summarized in the table below:

Table 1. Technical details of the Bujagali HPP

Dam Type	Clay core rock fill dam
Dam Height	28 m
Dam Crest Length	560 m
Spillway	Gated; 1 flap (300 m^3/s) and 2 radial (3000 m^3/s) gates
Type of Intake	Integral intake and power station
Installed Capacity	250 MW
Turbines	Kaplan (50 MW)
Number of Turbines	5
Maximum Discharge per Turbine	275 m^3/s
Generator Output	62 MVA
Power Station	Surface type in left channel around Dumbbell Island
Reservoir Surface Area	388 ha
Plant Load Factor	60%
Average annual Elec. generation	1,305 GWh

The plant underwent a testing period from February to July as units became operational (one unit per month). Electricity started being produced and exported to the grid in February 2012.

The evolution of the monthly production (MWh) and the monthly capacity factor (%) since commissioning are depicted in the graph below:

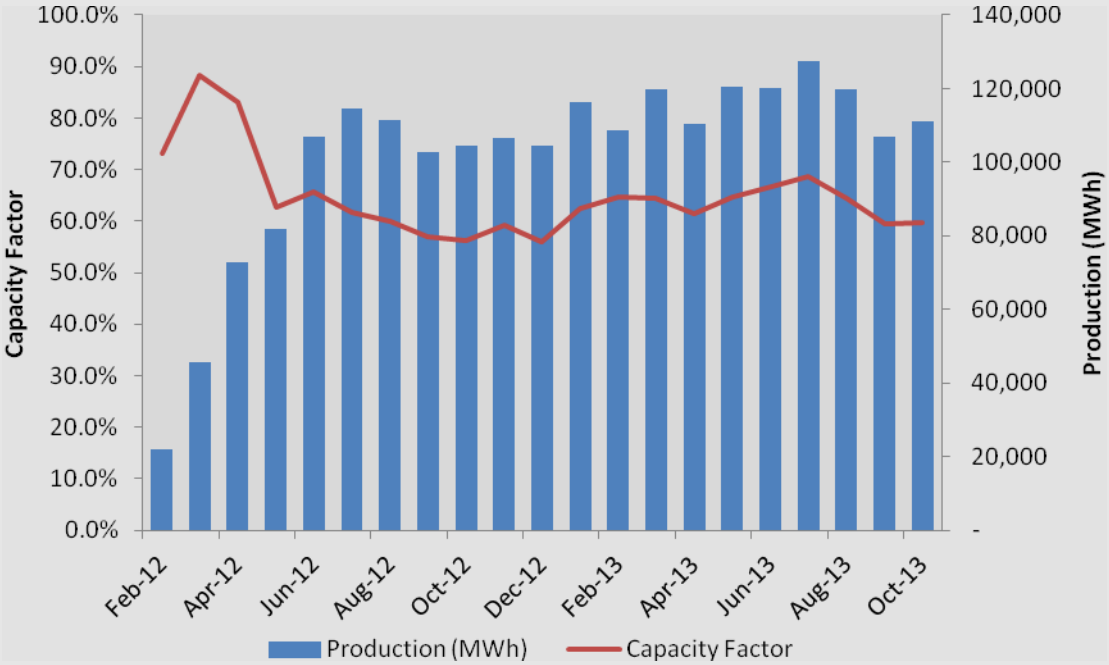

Figure 3: Monthly production February 2012-October 2013

Operation and maintenance activities started on 1st August 2012. Key parameters of the monthly operation and maintenance reports are given in the following table:

Table 2. Monthly operation and maintenance key parameters

Date	Production (MWh)	Capacity factor (%)
February 2012	21,975	73.2
March 2012	45,541	88.3
April 2012	72,740	83.0
May 2012	82,012	62.7
June 2012	107,056	65.6
July 2012	114,576	61.6
August 2012	111,341	59.9
September 2012	102,626	57.0
October 2012	104,562	56.2
November 2012	106,423	59.1
December 2012	104,325	56.1
January 2013	116,338	62.5
February 2013	108,652	64.7
March 2013	119,957	64.5
April 2013	110,468	61.4
May 2013	120,438	64.8

June 2013	120,055	66.7
July 2013	127,523	68.6
August 2013	119,841	64.4
September 2013	106,866	59.4
October 2013	111,017	59.7

Each year, several unit inspections (specific outages) were planned. This sum up to 9 days for unit 4 and 10 days for the rest of the units. The balance up to 15 days/unit is used for fixing pending points by the contractor.

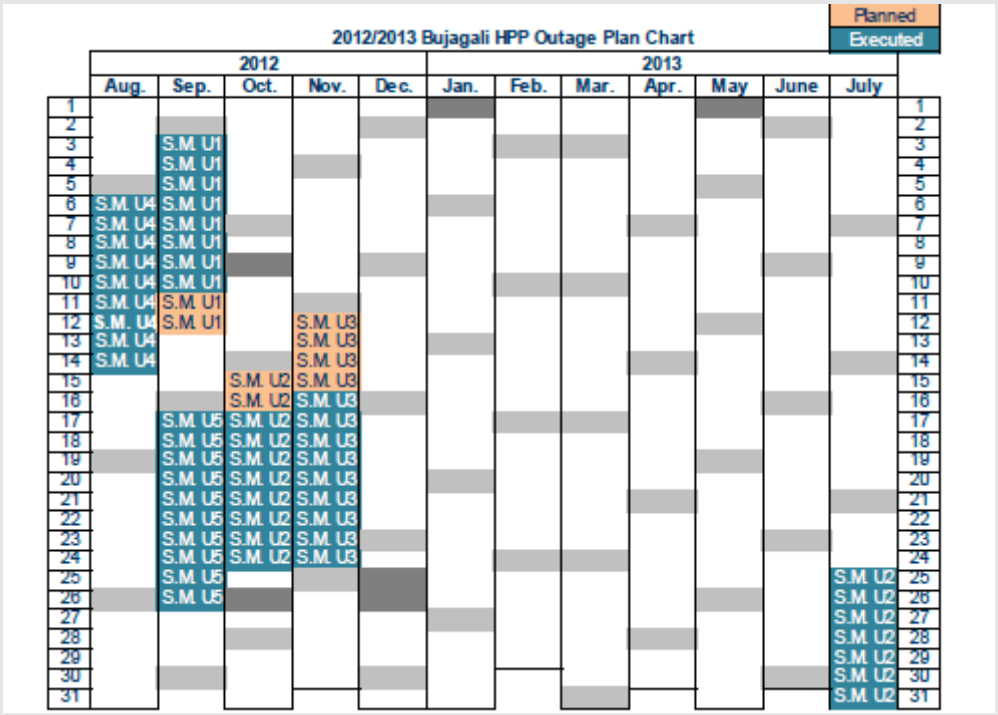

Figure 4: Bujagali HPP Outage Plan Chart August 2012 - July 2013

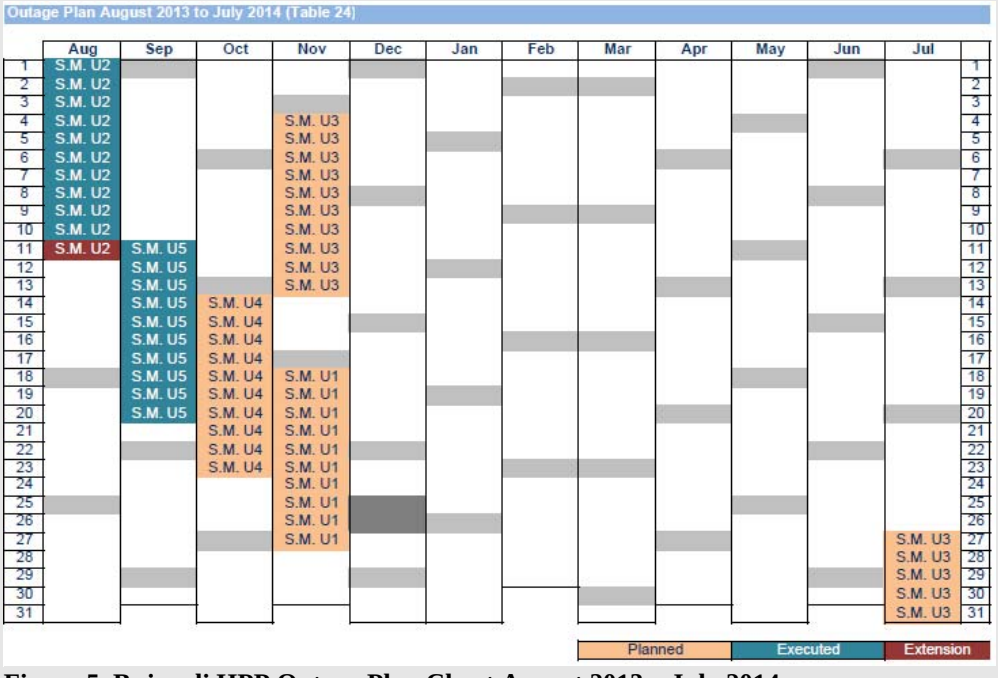

Figure 5. Bujagali HPP Outage Plan Chart August 2013 – July 2014

The following chart shows the most updated information (September 2013) of the operations organization of the plant.

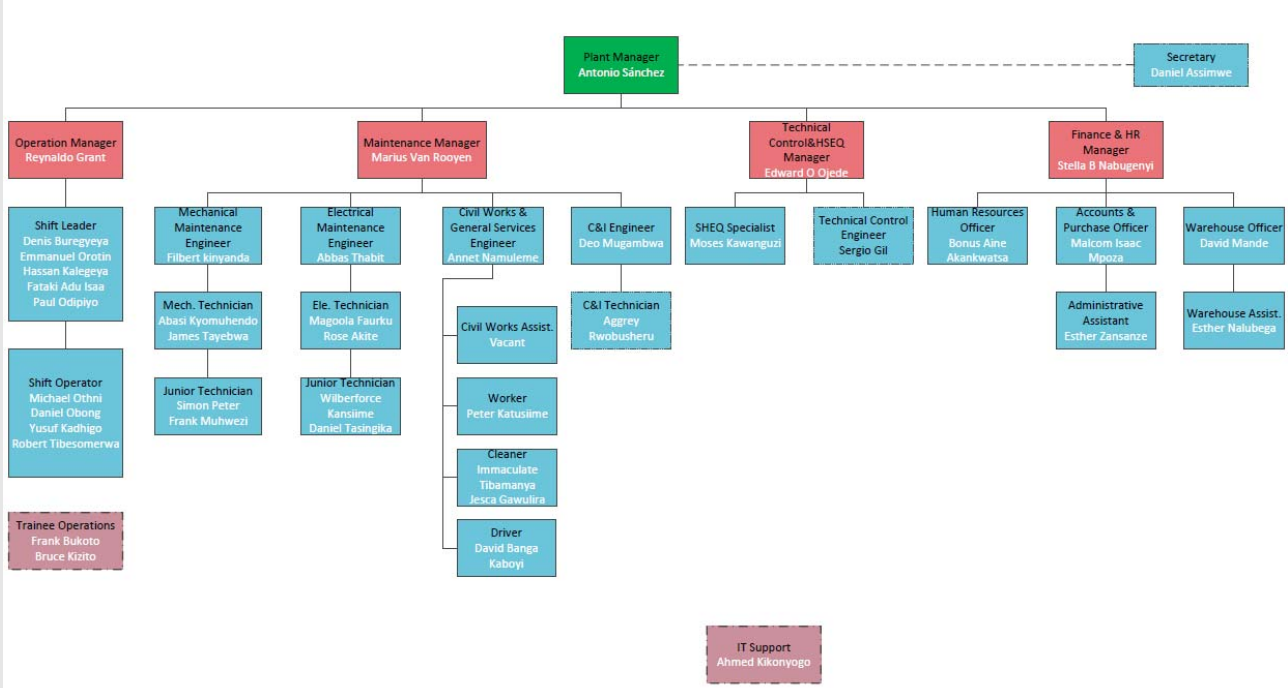

Figure 6. Bujagali Hydropower Plant Operations Organization

B.2. Post registration changes

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

No temporary deviations have been applied this monitoring period.

B.2.2. Corrections

No corrections to project information or parameters have been.

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

No changes from the registered monitoring plan or applied methodologies have been made.

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

No changes to the project design of the registered activity have been made.

B.2.5. Changes to start date of crediting period

No changes to the start date of the crediting period have been made.

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

Not Applicable to the project activity.

SECTION C. Description of monitoring system

The approved monitoring methodology ACM0002 was used to develop the site specific monitoring plan implemented by the Bujagali General Manager and Staff. The Bujagali General Manager and staff were provided training to ensure the monitoring tasks would be implement according to the monitoring plan and that the real, measurable and long-term greenhouse gas (GHG) emission reduction for the proposed Project are monitored and reported. A description of the monitoring system is given below.

The monitoring system required the Bujagali General Manager to assign one monitoring supervisor and at least one monitoring technician per shift responsible for data reading (in case of manual readings), collection, archiving and reporting. The monitoring technician reports and archives the monitoring data daily. In case of automatic archiving, the technician makes sure that the data is recorded and filed correctly into the plant's servers. The daily reports are signed by the monitoring technician and approved by the monitoring supervisor.

The monitoring supervisor checks the consistency and accuracy of the data daily. It is not possible to have one person covering both of the responsibilities. The tasks and responsibility of the monitoring supervisor and technician are described as follows:

Monitoring technician:

- Daily check on metering equipment and ensuring their continuous performance and reporting any unusual issue in the daily reports to the monitoring supervisor;
- Measuring and recording/archiving the data according to the monitoring manual;
- Filing in (in case of automatic measurement and archiving, print out) daily monitoring forms, signing and reporting them for internal approval by the monitoring supervisor; The reports shall include comments on any possible unusual performance of the meters and the monitoring procedure;
- Following necessary calibration schedules for metering equipment if necessary under the monitoring supervisor guidance;

Monitoring supervisor:

- Responsible for the monitoring operation and procedures performed by the monitoring technician;
- Reviewing and approving (signing) the daily monitoring reports prepared by the monitoring technician;
- Checking the consistency of the daily metered and recorded data in compliance with the methodology and according to the monitoring plan in the registered PDD;
- Scheduling necessary calibration plans for the meters following the "Guidelines for Assessing Compliance with the Calibration Frequency Requirements" version 1.0;
- Preparing and annual CDM monitoring reports to be approved by the General Manager of the plant;

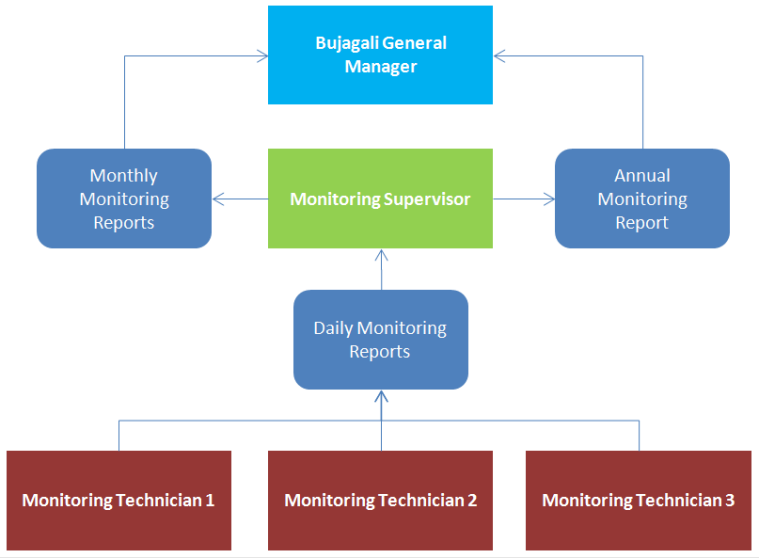

Figure 7. CDM Monitoring organisation at Bujagali Hydropower Plant

The data monitored, measured and recorded as per the PDD and the methodology are:
1. Net Exported Electricity ($EG_{Facility,y}$)
2. Installed capacity (CAP_{PJ})
3. Surface area of the reservoir (A_{PJ})

The latter two parameters are only used to monitor the power density of the plant and ensure that there are no major methane emissions from the reservoir.

1. Net Exported Electricity ($EG_{Facility,y}$)

Net Exported Electricity refers to the quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)

The net electricity fed into the grid is monitored continuously through meters installed at the switchyard of the plant. The control system at Bujagali allows the recording continuously and automatically of the exported electricity which is the preferable approach under CDM verification requirements There is one main meter and one back-up meter for each of the five turbine units. The amount of exported electricity is reported as the sum of the readings on the main meters. The back-up meters and the main meters are compared each month and sent for recalibration if the difference between the two exceeds 0.5%.

According to the methodology and in compliance with the registered monitoring plan, the monitoring procedure for this parameter is as follows:

Monitoring and metering frequency: At Bujagali monitoring is continuous, reading is done digitally and the recording is carried out for every 15 minutes. Bujagali meets the monitoring requirements.

Calibration: Bujagali has ensured that the metering equipment is calibrated appropriately in accordance with the manufacturer's guidelines. The calibration procedure in accordance with the monitoring plan also follows IEC standards. Meters are calibrated every 10 years, or if the difference between the back-up and the main meter exceeds 0.5%.

Accuracy and Quality Control: Meters are checked and calibrated periodically and measured data is cross checked against a second meter and the electricity invoices issued for UETCL. The most conservative data is used to calculate CERs generated by the Project.

The metering equipment has sufficient accuracy so that any error resulting from such equipment does not exceed 0.5% of full scale rating. The calibration procedure follow IEC Class 0.2S accuracy standard.

2. Installed capacity (CAP_{PJ})
Installed capacity refers to the capacity of the hydro power plant after the implementation of the project activity (W)

Installed capacity of the plant will remain the same during the crediting period in accordance with the registered PDD. The verifier may check the installed capacity through the name plates of the installed and operational generators. Additionally the verifier may cross check the installed capacity with the recorded power load of the plant during its operation for the monitoring period.

Measurement procedure: The installed capacity may be checked through performance logs of the generators and turbines at the power plant through measuring equipment ION 7550 having a IEC standard, class 0.2S accuracy.

3. Surface area of the reservoir (A_{PJ})
Surface area of the reservoir refers to the area of the reservoir measured at the surface of the water, after the implementation of the Project activity, when the reservoir is full (m2)

This parameter is determined annually based on the maximum water level possible at the reservoir of the plant using topographical surveys, maps, satellite pictures, etc. The reservoir measurement can be summarised as follows:

- Contour map of the project area;

- Supporting topographical maps of the complete reservoir area upstream of the plant;
- Supporting hydrographic maps comprising survey of the river channels upstream of the plant;

SECTION D. Data and parameters

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

Data / Parameter:	$EG_{m,y}$ $EG_{k,y}$
Unit:	MWh
Description:	Net electricity generated by power plant/unit *m or k* in year *y*
Source of data:	Raw data supplied by UETCL
Value(s) applied):	Different values per power plant – (as per the data sheet and ER calculations attached in Annex 3 of the PDD)
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment:	Details of BM and OM emission factor calculations are available in Annex 3 of the PDD.

Data / Parameter:	Plant name of the set of plants *m* representing the build margin.
Unit:	Text
Description:	Identification of power plants for the Build Margin.
Source of data:	Data supplied by UETCL.
Value(s) applied):	Different names and dates of becoming operational
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment:	This data are available in spreadsheets of PDD.

Data / Parameter:	Energy companies representing the operating margin.
Unit:	Text
Description:	Identification of power plants for the Operating Margin.
Source of data:	Data supplied by UETCL.
Value(s) applied):	Different names.
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment:	This data are available in spreadsheets of PDD.

Data / Parameter:	$FC_{i,m,y}$
Unit:	Litres
Description:	Amount of fossil fuel type i consumed by power plant / unit m in year y
Source of data:	Raw data supplied by UETCL and was processed in spreadsheets.
Value(s) applied):	Different values per power plant/power company – data sheet and ER calculations attached in the PDD.
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment:	Details of calculations are available in spreadsheets of the PDD.

Data / Parameter:	$NCV_{i,y}$
Unit:	GJ/liter
Description:	Net calorific value (energy content) of fossil fuel type i in year y.
Source of data:	Diesel: Local certified data from Aggreko Uganda Power Plants HFO: Local certified data from Jacobsen Uganda Power Plant
Value(s) applied):	Diesel= 0.03616 GJ/Litre (42.8 TJ/kt, 0.85 kg/l) HFO= 0.03857 GJ/Litre (40.6 TJ/kt, 0.955kg/l)
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment:	-

Data / Parameter:	$EF_{CO_2,i,m,y}$
Unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type *i*, power plant *m*, in year *y*.
Source of data:	IPCC: the lower limit of the uncertainty at a 95% confidence interval as provided in Chap 1, Vol 2 (Energy) 2006 IPCC Guidelines (2006)
Value(s) applied):	• Aggreko-Lugogo (Diesel): 0.0726 tCO_2/GJ • Aggreko-Kiira (Diesel): 0.0726 tCO_2/GJ • Aggreko-Mutundwe (Diesel): 0.0726 tCO_2/GJ • Namanve – Jacobson (HFO): 0.0755 tCO_2/GJ
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment:	-

Data / Parameter:	$EF_{grid,BM,y}$
Unit:	tCO_2/MWh
Description:	Build margin (BM) emission factor.
Source of data:	Calculated ex-ante based on the data supplied by UETCL as per the "Tool to calculate the emission factor for an electricity system".
Value(s) applied):	0.614 (2009) – (as per the data sheet and ER calculations in the PDD)
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment:	Details of calculations are available in spreadsheets of the PDD.

Data / Parameter:	$EF_{grid,OM-adj,y}$
Unit:	tCO_2/MWh
Description:	Simple adjusted operating margin CO_2 emission factor
Source of data:	Calculated ex-ante based on the data supplied by UETCL as per the "Tool to calculate the emission factor for an electricity system".
Value(s) applied):	0.701 – (as per the data sheet and ER calculations in the PDD)
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment:	Details of calculations are available in spreadsheets of the PDD.

Data / Parameter:	$EF_{grid,CM,y}$
Unit:	tCO_2/MWh

Description:	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"
Source of data:	Calculated ex-ante based on the data supplied by UETCL as per the "Tool to calculate the emission factor for an electricity system".
Value(s) applied):	0.658 – (as per the data sheet and ER calculations in the PDD)
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks.
Additional comment:	Details of calculations are available in spreadsheets.

Data / Parameter:	EF_{Res}
Unit:	$kgCO_{2e}/MWh$
Description:	Default emission factor for emissions from reservoirs
Source of data:	According to EB23, Annex 5: If the power density of the project is greater than 10 W/m^2, the project emissions from the reservoir may be neglected. If the power density is between 4 and 10 W/m^2 the reservoir emission factor shall be considered $90gCO_2/kWh$. Projects with reservoir power density equal or below 4 W/m^2 cannot use the methodology.
Value(s) applied):	Zero. The power density of the project is well above 10W/m2 therefore CH4 and CO_2 emissions from the reservoir are negligible.
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	-

Data / Parameter:	CAP_{BL}
Unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity.
Source of data:	For new projects this value is zero.
Value(s) applied):	Zero. The project is a Greenfield activity
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	-

Data / Parameter:	A_{BL}
Unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, then the reservoir is full (m^2). For new reservoirs this value is zero.
Source of data:	For new projects this value is zero.
Value(s) applied):	Zero. The project is a Greenfield activity
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	-

D.2. Data and parameters monitored

Data / Parameter:	$EG_{Facility,y}$
Unit:	MWh/y
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Measured/ Calculated / Default:	Measured
Source of data:	Will be measured by two factory calibrated digital meters. Continuous onsite measurement and monthly recording by the Project owner. The metering equipment is a digital energy meter factory calibrated having a qualified accuracy. It is capable of measuring energy into and out of the project site.
Value(s) of monitored parameter:	2012: 968,581 MWh 01 Jan – 31 Oct. 2013: 1,161,154 MWh
Monitoring equipment:	Meters Manufacturer – Schneider Type – ION 7550 Serial Nos. G1 Main: PI – 0905A078-01 G1 Check: PI – 0905A056-01 G2 Main: PI – 0905A085-01 G2 Check: PI – 0905A079-01 G3 Main: PI – 0905A180-01 G3 Check: PI – 0905A179-01 G4 Main: PI – 0905A086-01 G4 Check: PI – 0905A057-01 G5 Main: PI – 0905A055-01 G5 Check: PI – 0905A082-01
Measuring/ Reading/ Recording frequency:	Continuous onsite measurement and monthly recording by the Project owner.
Calculation method (if applicable):	N/A
QA/QC procedures:	The metering equipment is a digital energy meter factory calibrated having a qualified accuracy. It is capable of measuring energy into and out of the project site. Meters are checked and calibrated periodically and measured data is cross checked by electricity invoices and sales documents. The most conservative data is used to calculate CERs generated by the Project during the verification. The calibration procedure follows IEC standards. The factory calibration is a PPA requirement. Meters are calibrated once every ten years, or if the difference between the main meter and check meter exceeds 0.5%. Meters were calibrated on 08-04-2011. The metering equipment has sufficient accuracy so that any error resulting from such equipment shall not exceed 0.5% of full scale rating. The ION 7550 accuracy used in factory tests is according to IEC62053-22 1A 0.2S (formerly IEC 60687 1A 0.2S). The calibration procedure follows the IEC Class 0.2S accuracy standard.
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment:	-

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:	On the name plates of the installed and operational generators.
Value(s) of monitored parameter:	250,000,000 W (250 MW)
Monitoring equipment:	The installed capacity will be checked through performance logs of the generators and turbines at the power plant through measuring equipment ION 7550 having a IEC standard, class 0.2S accuracy.
Measuring/ Reading/ Recording frequency:	N/A
Calculation method (if applicable):	N/A
QA/QC procedures:	N/A
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	Installed capacity of the plant will remain the same during the crediting period in accordance with the registered PDD. The verifier may check the installed capacity through the name plates of the installed and operational generators. Additionally the verifier may cross check the installed capacity with the recorded power load of the plant during its operation for the monitoring period.

Data / Parameter:	A_{PJ}
Unit:	Surface area of the reservoir
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the Project activity, when the reservoir is full.
Measured/ Calculated / Default:	Calculated
Source of data:	Bujagali Hydropower Project Social and Environmental Assessment Report, Main Report, December 2006
Value(s) of monitored parameter:	3,880,000 m^2 (388 ha)
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	The power density of the project is 64 W/m^2 when reservoir water level is at the maximum level. This is the lowest possible power density value for the Project which is well above 10W/m2 therefore CH4 and CO_2 emissions from the reservoir are negligible.
QA/QC procedures:	-
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	-

D.3. Implementation of sampling plan

Sampling Plan is not applicable to project activity.

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

As described in the PDD, the ex-ante amount of emission reductions due to Project activity is calculated as the difference between the amount of emissions in the baseline and possible emissions due to Project which can be formulated as the following:

$$ER_y = BE_y - PE_y \quad (1)$$

Where:

ER_y	the emission reduction due to project activity (tCO_2e);
BE_y	the baseline emissions (tCO_2e);
PE_y	emissions due to project activity (tCO_2e) are equal to zero for this project

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

Baseline emissions (BE_y):

Baseline emissions (BE_y) are calculated as:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y} \quad (2)$$

Where:

BE_y	the baseline emissions for the crediting period y (tCO_2e);
$EG_{PJ,y}$	quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity during crediting period y (MWh), since Bujagali is a Greenfield project $EG_{PJ,y}=EG_{Facility,y}$
$EG_{Facility,y}$	Quantity of net electricity generation supplied by the project plant/unit to the grid during crediting period y
$EF_{grid,CM,y}$	the Combined Margin (CM) CO_2 emission factor of the grid connected power generation during crediting period y (tCO_2/MWh)

The quantity of net electricity generation supplied by the project to the grid is provided by the project owner. The monthly raw data for this verification period is available and can be reviewed in Annex 1 of this Monitoring Report. **$EG_{Facility}$ for this crediting period is 2,129,736 MWh**

CM emission factor is calculated as per the "Tool to calculate the emission factor for an electricity system" as described in B.6.1 under steps 1-7. The calculated value is 0.658 t CO_2e/MWh. Detailed calculations of CM are includes in the PDD.

Using equation 2, the baseline emissions fir the first monitoring period are calculated to be **1,400,523 tCO_2 equivalent.**

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

Project emissions (PE_y):

Project emissions (PE_y) includes emissions from the inundation of land. The Project does not include use of backup fossil fuel fired power capacity on the Project site, which will be very rare. Emissions from the inundation of land should be taken into account only if the power density of the Project is below 10 W/m^2. Since the power density of the Project is 64 W/m^2, possible emissions from land inundation are not taken into account as Project emissions.

$$PE_y = PE_{FF,y} + PE_{HP,y} \quad (3)$$

PE_y	project emissions in year y (tCO_{2e}/yr)
$PE_{FF,y}$	project emissions from fossil fuel consumption in year y (tCO_2/yr)
$PE_{HP,y}$	project emissions from water reservoirs of hydropower plants in year y (tCO_{2e}/yr)

In the Project $PE_{FF,y}$ and $PE_{HP,y}$ are equal to zero. Therefore:

$$PE_y = 0 \quad (4)$$

E.3. Calculation of leakage

According to ACM0002 version 12, project leakage such as emissions during Project construction are negligible and are not taken into account.

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

Ex-ante Emission Reductions (ER_y):

Ex-ante emission reductions are calculated by deducting the project emissions from the baseline emissions.

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	1,400,523	0	0	1,400,523

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)	1,648,162	1,400,523

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

The difference between the ex-ante emissions calculated in the registered PDD and the actual value achieved during monitoring period is explained by the fact that the plant's five units were brought online one unit at a time during the February – May 2012 timeframe .

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)	636,943	763,580

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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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