 <b>Monitoring report form for CDM project activity (Version 06.0)</b>		
<b>MONITORING REPORT</b>		
<b>Title of the project activity</b>	12 MW hydropower plant in Bhandardara in Maharashtra, India.	
<b>UNFCCC reference number of the project activity</b>	0430	
<b>Version number of the PDD applicable to this monitoring report</b>	Registered PDD version 09, dated 16/07/2016	
<b>Version number of this monitoring report</b>	01	
<b>Completion date of this monitoring report</b>	25/01/2018	
<b>Monitoring period number</b>	02 (of the 3 <sup>rd</sup> crediting period)	
<b>Duration of this monitoring period</b>	01/11/2016 – 31/12/2017 (Inclusive of both the dates)	
<b>Monitoring report number for this monitoring report</b>	NA	
<b>Project participants</b>	<ul style="list-style-type: none"> <li>▪ Dodson–Lindblom Hydro Power Private Limited (DLHPPL)</li> <li>▪ Statkraft Markets GmbH</li> <li>▪ WeAct Pty Ltd.</li> </ul>	
<b>Host Party</b>	India	
<b>Sectoral scopes</b>	01, Energy Industries (renewable/non-renewable sources)	
<b>Applied methodologies and standardized baselines</b>	AMS-I.D. - Grid connected renewable electricity generation, version 18; Dated: 27/11/2014	
<b>Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period</b>	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	NA	39,849
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD</b>	40,896 <sup>1</sup>	

<sup>1</sup> Detailed calculation provided in ER sheet.

## SECTION A. Description of project activity

### A.1. General description of project activity

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#### **Purpose of the project activity**

The main purpose of the project activity is to generate electricity from the potential energy in the water released from Bhandardara dam and export the net electricity to the grid.

#### **Brief description of the installed technology and equipment:**

The Bhandardara dam is one of the oldest masonry gravity dams in Maharashtra state. The construction of the dam started in 1910 and was completed in 1926. There are two hydro power plants near Bhandardara dam. The project activity (capacity - 12MW) is constructed at the foot of a hill adjacent to the Bhandardara dam named as BH-1. Another hydroelectric project of 34 MW was constructed later 10 kilometers downstream from BH-1, which is referred as BH-2. BH-1 is the small scale project activity.

The water released from the Bhandardara reservoir for irrigation purpose is conducted to a turbine in the power plant and jetted on to the turbine. This action rotates the turbine, which in turn causes the rotation of the alternator connected to the turbine, thereby producing electricity. One 12 MW Francis type turbine is installed in BH-1. The generated electricity from the project activity after auxiliary consumption is exported to MSTCL grid.

BH-1 has exported about 57,907.20 MWh to grid during the current monitoring period. The plant and equipment facilities have been designed to comply with the applicable stipulations / guidelines of statutory authorities such as State Pollution Control Board etc.

The project activity (BH-1) is constructed at the foot of a hill adjacent to the Bhandardara dam. BH-1 was originally built by the Government of Maharashtra Irrigation Department (GOMID) with a single hydropower generating unit of 10 MW in 1984. In Maharashtra state, all state owned hydroelectric plants are constructed by Government of Maharashtra Water Resources Department (GOMWRD) and handed over to Maharashtra State Electricity Board (MSEB) (now Maharashtra State Electricity Generation Company) for operation and maintenance. The generating unit at BH-1 was commissioned in 1986 and started commercial operation in 1987. After operating for eight years, a mishap occurred which severely damaged the entire plant and the plant ceased to operate. The rehabilitation and operation of this plant was awarded on a lease, own, operate and transfer basis to Dodson – Lindblom International Inc (DLI), an Ohio, USA, based company. DLI is part of DLZ Corporation, one of the foremost engineering and water resource companies in the Midwestern United States. An operating company by the name of Dodson – Lindblom Hydro Power Private Limited (DLHPPL) was formed to implement and operate the hydropower plants in India. Although, technically it was called rehabilitation, the work involved construction of new plant. The damaged equipment was beyond use and plant could not be used and operated anymore; and hence disposed as scrap. The accident had caused such damage that entire plant had to be reconstructed. Thus, BH1 hydro has been started as a new plant. The generated power from the project activity is connected to state electricity grid owned and operated by Maharashtra State Transmission Company Ltd (MSTCL).

#### **Relevant dates for the project activity:**

The project has been registered with UNFCCC on 30/09/2006 with renewable crediting period. The project opted for the renewable crediting period and the duration of the first crediting period is from 27/07/2001 – 26/07/2008 and second crediting period is from 27/07/2008 – 26/07/2015. This is third crediting period which is applicable from 27/07/2015 – 26/07/2022. The amount of issued CERs from this project was 214,154 tCO<sub>2</sub> during the first crediting period and the amount of issued CERs from this project was 179,537 during Second crediting period.

This is the second monitoring period under the third crediting period. During the current monitoring period, the project has achieved total emissions reduction of 39,849 tCO<sub>2</sub>e.

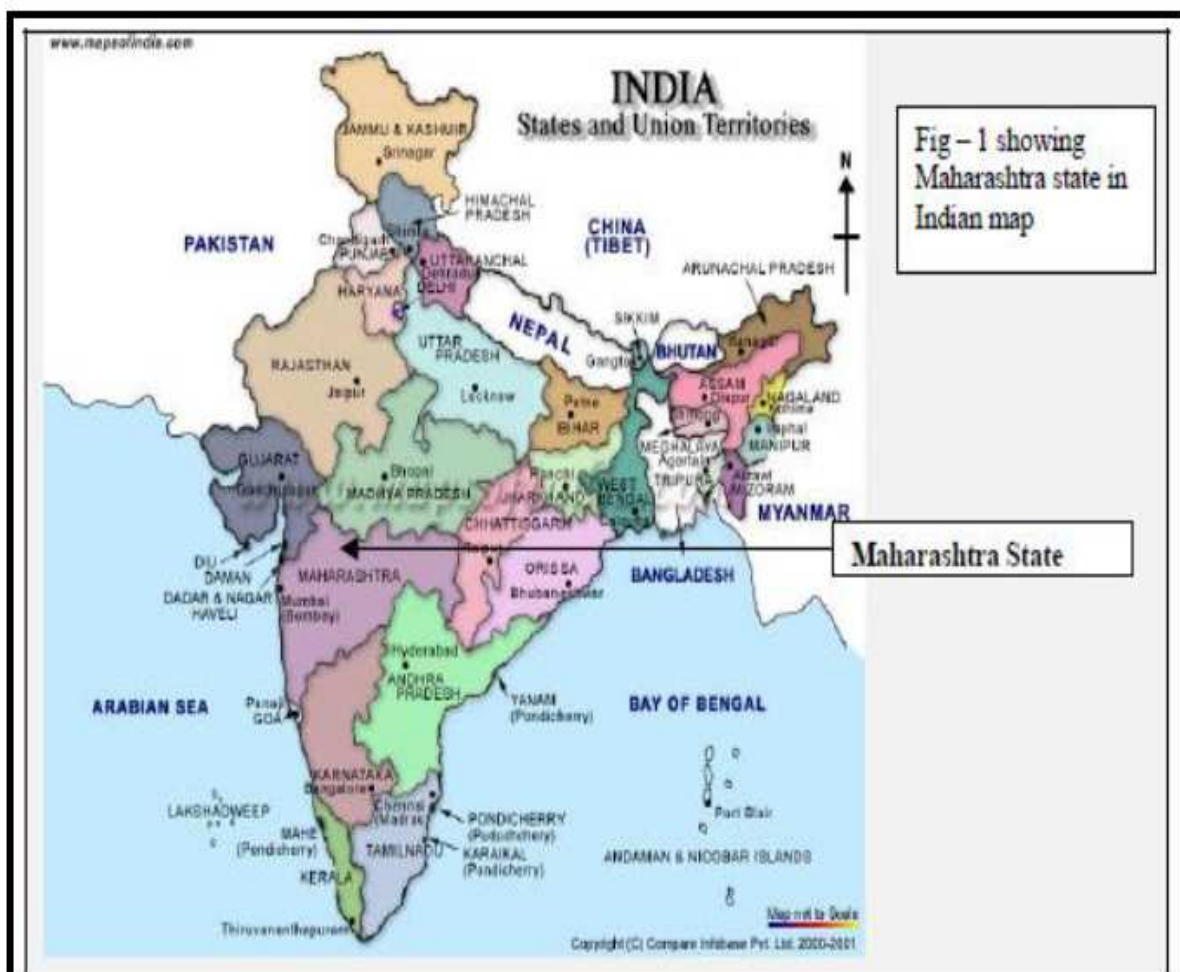
## A.2. Location of project activity

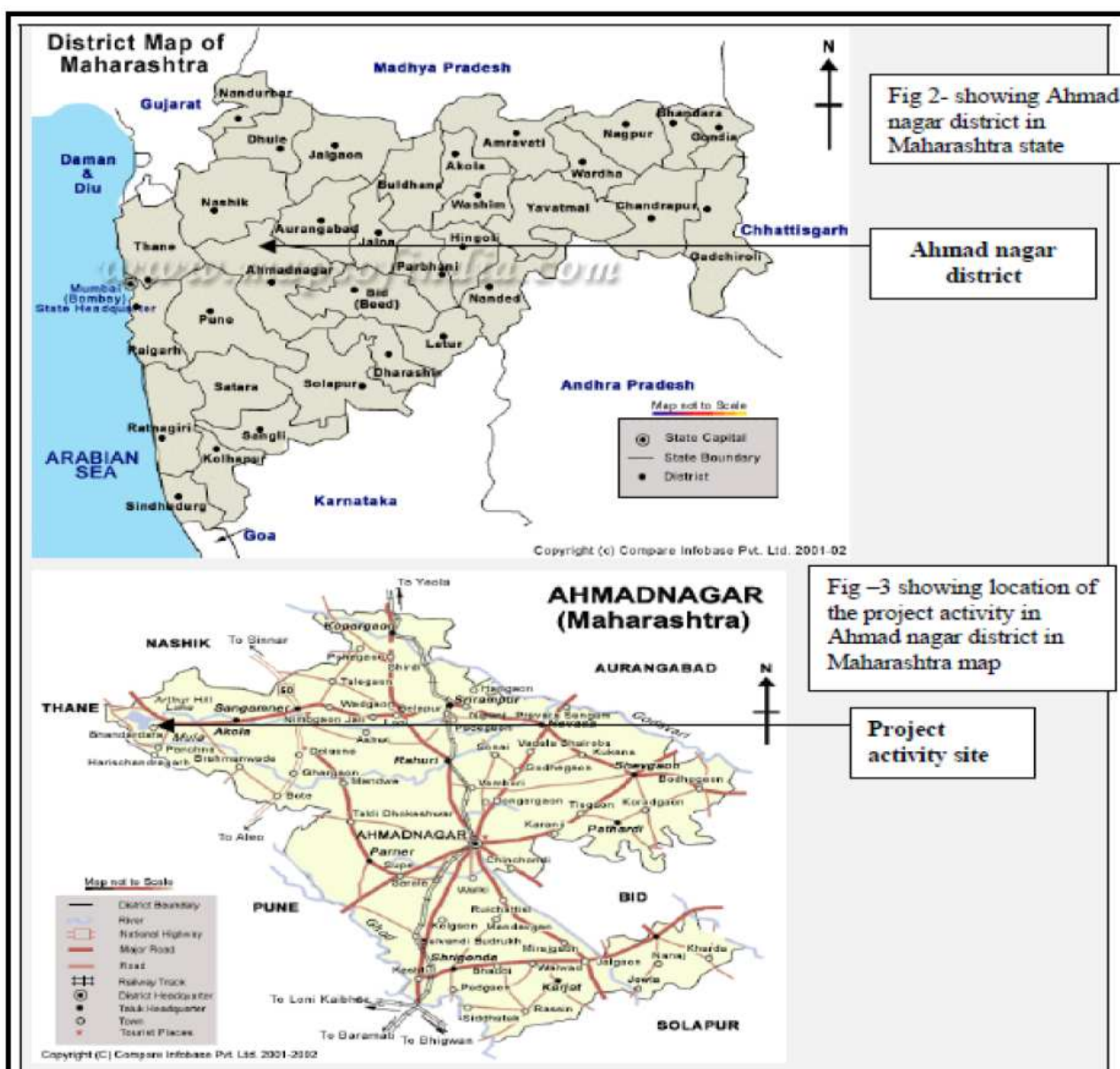
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The project activity is located at a foot of a hill adjacent to the Bhandardara dam in Lake Arthur Hill reservoir in the upper Pravara river basin. Bhandardara is about 140 kilometres from Mumbai. The nearest town is Ghoti and closest railhead is at Igatpuri which is 40 kilometres away.

- (a) Host Part(ies): India
- (b) Region /State/Province: Maharashtra
- (c) City/Town/Community: Bhandardara village, Akola Taluk, Ahmednagar district.
- (d) Physical/ Geographical location: Latitude 19° 33' 15" N and longitude 73° 45' 0" E.

The location of project activity is shown in following figures – Fig 1 & 2:





### A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	Dodson –Lindblom Hydro Power Private Limited (DLHPPL) (Private Entity)	No
Switzerland	Statkraft Markets GmbH (Private Entity)	No
Australia	WeAct Pty Ltd. (Private Entity)	No

**A.4. Reference to applied methodologies and standardized baselines**

&gt;&gt;

Renewable electricity generation for a grid in accordance with approved small scale methodology AMS I.D.

Type I : Renewable energy project  
 Sectoral Scope : 01, Energy Industries  
 Category I.D : Grid connected renewable electricity generation, version 18<sup>2</sup>

Reference : Reference has been taken from the list of the small-scale CDM project activity categories contained in Appendix B of the simplified M&P for small-scale CDM project activities.

Tool reference:

"Tool to calculate the emission factor for an electricity system" Version 5

"Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion, Version 02".

**Standardized baseline:** Not applicable.

**A.5. Crediting period type and duration**

&gt;&gt;

Crediting Period Selected: Renewable crediting period (3\*7 years).

Number of Crediting period: 3<sup>rd</sup> Crediting Period (27/07/2015 – 26/07/2022)

Start date of the 3<sup>rd</sup> Crediting Period : 27/07/2015  
 End date of the 3<sup>rd</sup> Crediting Period : 26/07/2022

Duration of the 2<sup>nd</sup> Crediting Period : 27/07/2008 – 26/07/2015  
 Duration of 1<sup>st</sup> Crediting Period : 27/07/2001 – 26/07/2008

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<sup>2</sup> [http://cdm.unfccc.int/filestorage/2/P/7/2P7FS6ZQAR84LG3NMKYUH50WI9ODBC/EB81\\_repan24\\_AMS-I.D\\_ver18.pdf?t=QIB8bzlxdmx6fDAkc8q3AmLb-E6crYbSSR3o](http://cdm.unfccc.int/filestorage/2/P/7/2P7FS6ZQAR84LG3NMKYUH50WI9ODBC/EB81_repan24_AMS-I.D_ver18.pdf?t=QIB8bzlxdmx6fDAkc8q3AmLb-E6crYbSSR3o)

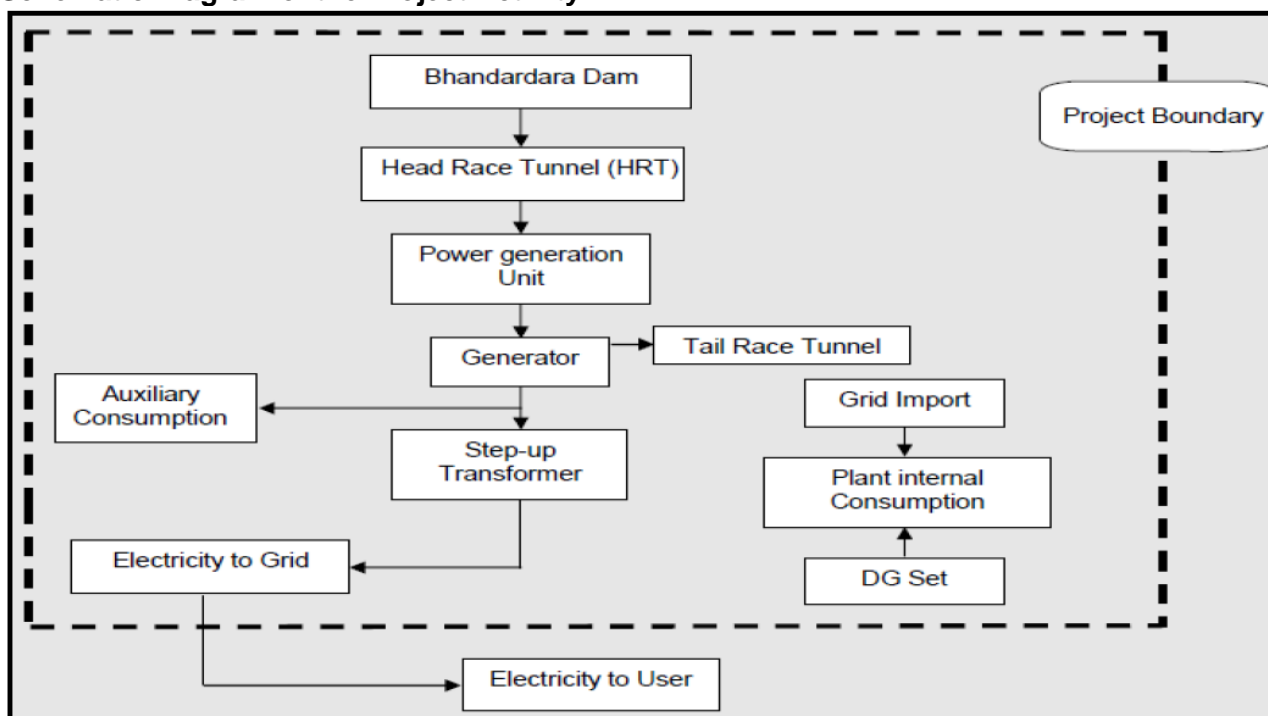
## SECTION B. Implementation of project activity

### B.1. Description of implemented project activity

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There is one Francis turbine is employed in the project activity. The flowing water is guided through a head race tunnel and penstock gate and jetted on to a turbine. This action rotates the turbine, which is connected to a synchronous generator. The rotation of turbine causes the rotation of the generator thereby producing electricity. The generated electricity is stepped up to 132 kV and exported to MSTCL grid, which is part of regional grid. The technical specifications of the employed technology are provided in Annex 1.

#### Schematic Diagram of the Project Activity:



The capacities of the project equipment's are not changed during this monitoring period and no emergency incidents occurred during this period that may change the applicability of the methodology or change the emission reductions.

### B.2. Post-registration changes

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

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Not Applicable

#### B.2.2. Corrections

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Not Applicable

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

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Not Applicable

**B.2.4. Inclusion of monitoring plan**

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Not Applicable

**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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Not Applicable

**B.2.6. Changes to project design**

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Not Applicable

## SECTION C. Description of monitoring system

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The monitoring system has been considered in line with Monitoring Plan prescribed in the renewal PDD, version 9, under the section B.7.3. The details are discussed below:

**Electricity generated by the project activity:** The power exported by the project activity would be monitored to the best accuracy<sup>3</sup> and as per section D.2.

The general principles for monitoring above parameters are based on:

- ✓ Frequency
- ✓ Data recording
- ✓ Reliability
- ✓ Experience and training

### Frequency

Joint meter reading (JMR) of main and check meters installed at the substation shall be taken and signed by authorised officials of DLHPPL, MSEDCL, MSETCL and GOMWRD generally once every month. Daily data recording by the shift in-charge of DLHPPL is there at generation end. Joint meter reading shall be the basis for monthly invoice of energy exported to the grid.

### Data recording

Records of the joint meter reading of energy generated and exported to the grid would be maintained by DLHPPL, MSEDCL, MSETCL and GOMWRD. Daily and monthly reports stating the generation and power export would be prepared by the shift in-charge and verified by the plant manager.

### Reliability

For measuring the energy exported to the grid, one main meter and one check meter are maintained. Joint meter reading of the main meter is the basis of billing and emission reduction calculations, so long the meter is found to be within prescribed limits of error during the periodic check.

Joint meter reading of main and check meters are taken and signed by authorised officials of DLHPPL, MSEDCL, MSETCL and GOMWRD once every month. Records of this joint meter reading are maintained by DLHPPL, MSEDCL, MSETCL and GOMWRD.

The main and check meters installed are jointly inspected and sealed and are not interfered with, by DLHPPL, MSEDCL or MSETCL except in presence of the other party. The meters are checked for accuracy and calibration by the MSETCL as per the provisions in the power purchase agreement (PPA) prevailing at the time of respective accuracy check or calibration. As per the current PPA, the meters are checked for accuracy every six months and the calibration is done once in a year. The meters are checked for accuracy and/or calibrated at MSETCL's laboratory and sealed by MSEDCL, MSETCL and DLHPPL jointly.

If during periodic test check, main meter is found to be within permissible limits of error and check meter is found to be beyond permissible limits, then billing as well as emission reduction calculations are as per main meter as usual. However, the check meter would be calibrated and/ or replaced if required. If during test check, the main meter is found to be beyond permissible limits of error but check meter is found to be within permissible limits, then billing as well as emission reduction calculation for the month and up to date and time of the calibration/replacement of defective main meter shall be as per check meter. The main meter would be immediately

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<sup>3</sup> Details of Energy Meters & their testing has been provided in Annex-1 of the MR.



calibrated and/ or replaced, as may be necessary where after billing as well as emission reduction calculation would be as per main meter.

If during the periodic test checks, the main and check meter are both found to be beyond permissible limits of error, then both the meters would be immediately calibrated or replaced if required. In such an event, the emission reduction calculations for the period (which starts on the day of the previous accuracy or calibration whichever is later and ends on the day when the meter is calibrated and/ or replaced – also referred to as ‘defect period’) would be calculated based on the gross electricity generation data taken from the JMR and the auxiliary consumption. For this purpose, the auxiliary consumption would be worked out as a percentage of gross electricity generation pertaining to the same calendar period (also referred to as ‘reference period’) as that of the defect period corresponding to the previous year. The percentage auxiliary consumption will be the maximum of the monthly percentage auxiliary consumption in the reference period. This maximum of the monthly percentage auxiliary consumption would be used to compute the electricity export and therefore the emission reduction for the defect period.

The meters installed at the generator end shall be checked for accuracy every six months at the MSETCL laboratory and the calibration is done once in a year at MSETCL. If the accuracy of the meter is found to be beyond permissible limit even after calibration then the meter shall be replaced with spare tested, calibrated meter.

DLHPPL shall archive and preserve all the JMRs pertaining to the energy generated and exported by the project activity, for at least two years after end of the crediting period. DLHPPL shall also archive the complete metering data at generation end and export data on paper and all the data would be preserved for at least two years after end of the crediting period.

#### **Trippings due to grid failure**

Number of trippings due to grid failure are recorded and verified with the allowable pre-defined number for the equipment. Monitoring plan has been established to verify and to ensure that the number of failures is less than prescribed limits.

#### **Management structure for monitoring of parameters:**

Hourly data recording of the generation and export to the grid will be made by the electrician of the shift and verified by the shift engineer of DLHPPL and these data will be there at generation end. Daily and monthly reports stating the generation and power export are prepared by the shift in-charge and verified by the plant manager of DLHPPL. Plant manager of DLHPPL at site would maintain records of joint meter reading. MSEDCL (MSEB) also maintains the records of joint meter readings at their office.

Monthly invoices are prepared based on Joint meter readings, which will be used for cross checking the energy exported to the grid. The plant manager is a qualified engineer with considerable experience in power industry. All the shift engineers are qualified engineers and have undergone related training including plant operations, data monitoring, report generation etc.

#### **Procedures for handling data uncertainties:**

***In the event when verification period dates and JMR dates in the project activity, do not coincide***

#### ***For electricity exports:***

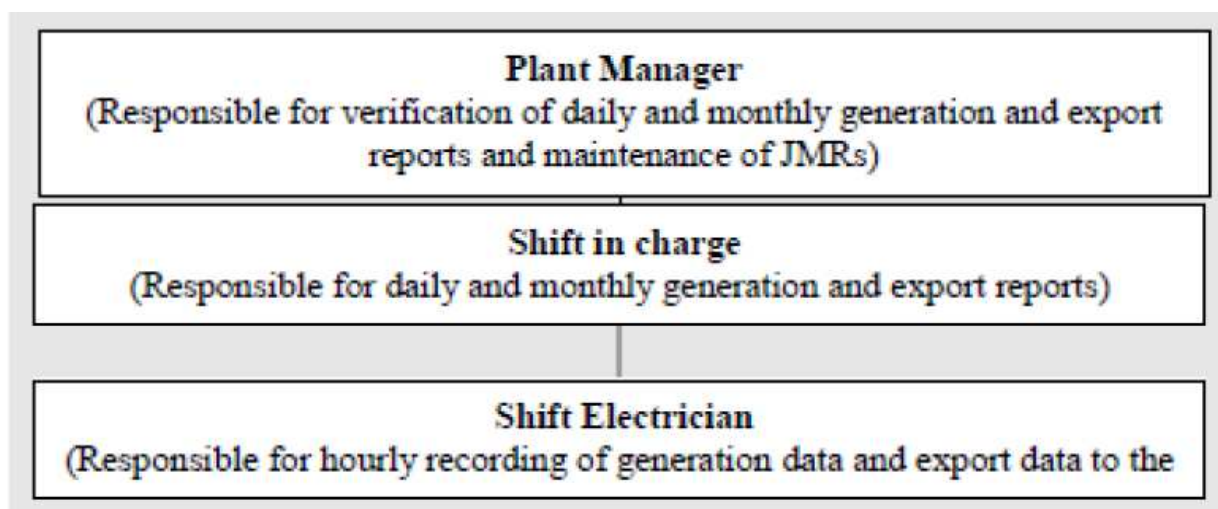
In the event when the individual verification period dates and the date of JMR pertaining to the project activity do not coincide, the following procedure would be adopted to estimate the electricity supplied to the grid during the specific period/ or days where there is a mismatch. The hourly electricity export readings ( $HEE_{main\_meter}$ ) recorded at the main meters would be monitored by DLHPPL for the project activity in their logbook. For the mismatch period, the hourly electricity export readings would be considered in order to arrive at the electricity supplied/ exported by the

project activity to the grid during that period. This method would be followed in cases where the starting or ending / last dates of the verification period do not match the JMR dates of the project activity.

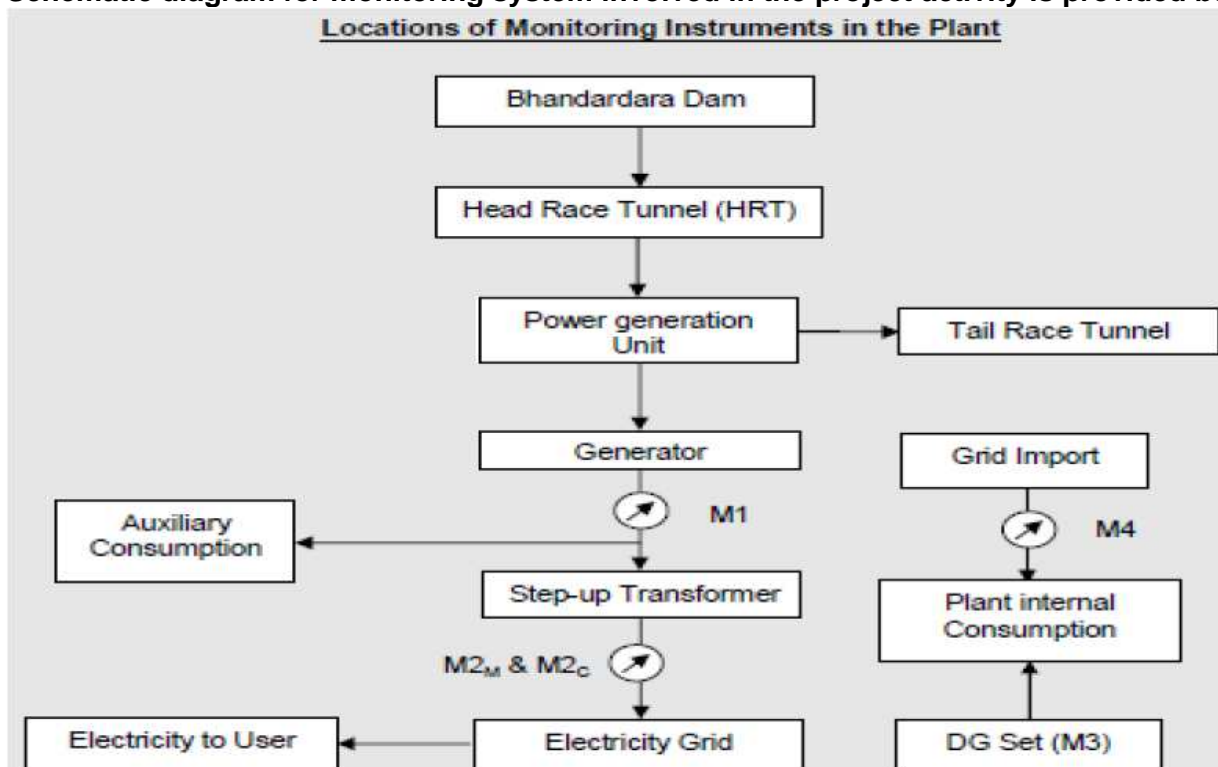
**For electricity imports:**

This is in the event when the individual verification period dates and the date of Monthly records for electricity imports (recorded by MSEDCL) pertaining to the project activity do not coincide. It is to be noted that the units imported are recorded on a monthly basis and issued by the MSEDCL. The maximum monthly electricity imports during the previous 12 months period (prior to the date of mismatch) would be arrived at. For the mismatch period, the maximum monthly electricity import as identified above would be taken and the daily import would be worked out based on the number of days during the concerned month. This daily import as worked out would be applied for those specific days of mismatch to estimate the total import for the mismatch period.

**Schematic diagram for the monitoring data flow at plant**



Schematic diagram for monitoring system involved in the project activity is provided below-



M1 : Gross Energy Meter  
M2<sub>M</sub> : Main Export meter  
M2<sub>C</sub> : Check Meter  
M3 : Measuring scale to monitor diesel consumption in DG set  
M4 : Electricity Import Meter

**SECTION D. Data and parameters****D.1. Data and parameters fixed ex ante**

<b>Data/Parameter</b>	CO <sub>2</sub> Emission factor of grid (EF <sub>y</sub> ) = EF <sub>CO<sub>2</sub>,grid, y</sub>
Unit	tCO <sub>2</sub> /MWh
Description	Combined Margin CO <sub>2</sub> Emission Factor of the NEWNE grid
Source of data	Central Electricity Authority (CEA), CO <sub>2</sub> baseline database for the Indian Power Sector, , Version 10 ,Dated 16 December 2014 (Combined Margin Emission Factor for Northern Regional Grid) published by Central Electric Authority (CEA), India <a href="http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf">http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf</a> 3.0, dated 15 December 2007
Value(s) applied	0.6890
Choice of data or measurement methods and procedures	CEA has estimated the simple operating margin and build margin emission factors for the Western regional grid. For calculating the CO <sub>2</sub> emission factor as per combined margin method for the second crediting period, the weights of 0.25 for operating margin and 0.75 for build margin are considered as per 'Tool to calculate the emission factor for an electricity system (Version 05.0)'. As per tool, the operating margin has been calculated as weight average value; whereas being the third crediting period, the value of build margin emission factor calculated during the second crediting period has been used.
Purpose of data/parameter	Calculation of baseline emission.
Additional comments	The emission factor has been fixed for the third crediting period.

<b>Data/Parameter</b>	Net Calorific values of diesel (NCV <sub>diesel</sub> )
Unit	GJ/Ton
Description	Net calorific value of diesel
Source of data	IPCC default data
Value(s) applied	43.3
Choice of data or measurement methods and procedures	IPCC default values at the upper limit of uncertainty at a 95% confidence intervals as provided in Table 1.2 of Chapter 1 of Vol 2 (Energy) of the 2006 IPCC guidelines on National GHG inventories, indicates that the NCV of diesel oil is 43.3 TJ/Gg which is equivalent to 43.3 GJ/ton
Purpose of data/parameter	Calculation of project emission
Additional comments	-

<b>Data/Parameter</b>	CO <sub>2</sub> emission factor of diesel (EF <sub>CO<sub>2</sub>,diesel</sub> )
Unit	tCO <sub>2</sub> e / GJ
Description	CO <sub>2</sub> emission factor of diesel
Source of data	IPCC
Value(s) applied	0.0748
Choice of data or measurement methods and procedures	IPCC default values
Purpose of data/parameter	Calculation of project emission
Additional comments	-

**D.2. Data and parameters monitored**

<b>Data/Parameter</b>	EGy
Unit	MWh
Description	Quantity of electricity exported to the grid by the project activity
Measured/calculated/default	Measured
Source of data	Joint Meter Readings (JMRs) taken and signed by authorized officials of MSEDCL
Value(s) of monitored parameter	57907.20
Monitoring equipment	Main Energy Meter and Check Energy Meters are used for net energy export <sup>4</sup>
Measuring/reading/recording frequency	Continuous monitoring, hourly measurement and at least monthly recording
Calculation method (if applicable)	Not applicable as the data is directly monitored.
QA/QC procedures	<p>For measuring the energy exported to the grid, one main meter and one check meter are maintained. Joint meter reading of the main meter is the basis of billing and emission reduction calculations, so long as the meter is found to be within prescribed limits of accuracy during the periodic check.</p> <p>Monthly joint meter reading of main and check meters are taken and signed by authorized officials of DLHPPL, MSEDCL, MSETCL and GOMWRD generally once every month. Records of this joint meter reading are maintained by DLHPPL, MSEDCL, MSETCL and GOMWRD.</p> <p>The Meters are checked for accuracy and calibration by the MSETCL as per the provisions in the power purchase agreement (PPA) prevailing at the time of respective accuracy check or calibration. As per the current PPA, the meters are checked for accuracy every six months and the calibration is done once in a year.</p>
Purpose of data/parameter	Calculation of baseline emission
Additional comments	The data would be archived upto two years after the end of crediting period.

<b>Data/Parameter</b>	Electricity Import (E <sub>Import</sub> )
Unit	MWh
Description	Electricity Imported from the grid by the project activity
Measured/calculated/default	Measured
Source of data	Monthly billing records of MSEDCL
Value(s) of monitored parameter	69.65 (monthly details are provided in the emission reduction spread sheet )
Monitoring equipment	The energy is imported at 33 kV feeder and a separate independent energy meter is installed by MSEDCL to measure the units imported by DLHPPL. The units are recorded monthly and bills are issued by MSEDCL. Bills of MSEDCL shall be the source of data electricity imported
Measuring/reading/recording frequency	Continuous monitoring, hourly measurement and at least monthly recording

<sup>4</sup> Meter details are provided in Annex 1.

Calculation method (if applicable)	Not applicable as the data is directly monitored.
QA/QC procedures	Import meter is under the custody of MSEDCL, and DLHPPL has no access to meter and the calibration details pertaining to the same. Hence, calibration records are not maintained by DLHPPL for the import meter.
Purpose of data/parameter	Calculation of Project emission
Additional comments	The data would be archived upto two years after the end of crediting period.

<b>Data/Parameter</b>	<b>Gross Electricity Generation (<math>E_{Gen}</math>)</b>
Unit	MWh
Description	Gross Electricity generated by the project activity
Measured/calculated/default	Measured
Source of data	Joint Meter Readings (JMR) taken & signed by authorized officials of MSEDCL.
Value(s) of monitored parameter	59025.40
Monitoring equipment	Gross energy meter is used to measure gross energy generation by the plant
Measuring/reading/recording frequency	Continuous monitoring, hourly measurement and at least monthly recording
Calculation method (if applicable)	Not Applicable as the data is directly monitored
QA/QC procedures	The data are directly measured and monitored at the project site. The meter installed at the generator end shall checked for accuracy for every six months and the calibration is done once in a year. If the accuracy of meter is found to be beyond permissible limit even after calibration than the meter replaced with spare tested, calibrated meter. DLHPPL shall archive all the JMRs and the complete metering data at generation end on paper and all the data would be preserved for at least two years after end of the crediting period.
Purpose of data/parameter	Calculation of baseline emission.
Additional comments	The data would be archived upto two years after the end of crediting period.

<b>Data/Parameter</b>	<b>Auxiliary Consumption</b>
Unit	MWh
Description	Unit consumed by the project activity
Measured/calculated/default	Calculated
Source of data	Joint Meter Readings (JMRs) taken and signed by authorized officials of MSEDCL and the gross electricity generation readings.
Value(s) of monitored parameter	1118.20
Monitoring equipment	NA. Data is calculated once in month
Measuring/reading/recording frequency	NA. Data is calculated once in month
Calculation method (if applicable)	The data is calculated using the gross electricity generation ( $E_{Gen}$ ) and electricity exported to the grid ( $E_{Gy}$ ) as per the JMR. The difference between the gross electricity generation ( $E_{Gen}$ ) and electricity exported to the grid ( $E_{Gy}$ ) as per the JMR gives the total Auxiliary Consumption in the plant. This Auxiliary consumption includes losses in Generator step up transformer, in cables and in excitation system, which are not actually measured. Besides these other auxiliary consumption are measured at Unit Auxiliary Board

QA/QC procedures	The data is calculated using the gross electricity generation ( $E_{Gen}$ ) and electricity exported to the grid ( $E_{Gy}$ ) as per the JMR. This data are also used in calculating electricity export in the event of simultaneous failure and/or defect in accuracy of both the main meter & check meter.
Purpose of data/parameter	Calculation of baseline emission.
Additional comments	The data would be archived upto two years after the end of crediting period.

Data/Parameter	Hourly Electricity Export ( $HEE_{main\_Meter}$ )
Unit	kWh
Description	Hourly electricity exported to the grid by the project activity as recorded at the main meter and check meter. This parameter is relevant to conditions/ circumstances (those days) where the dates of Joint Meter Readings (JMRs) pertaining to the project activity do not match the individual verification periods
Measured/calculated/default	This data is recorded on an hourly basis by DLHPPL based on data recorded at the main meter.
Source of data	Log Book Records for the main meter
Value(s) of monitored parameter	This parameter is used only for apportioning only. Details are provided in the emission reduction spread sheet
Monitoring equipment	Main Energy Meter and Check Energy Meters are used for net energy export
Measuring/reading/recording frequency	Continuous monitoring, hourly measurement and at least monthly recording. This parameter is relevant to conditions/ circumstances (those days) where the dates of Joint Meter Readings (JMRs) pertaining to the project activity do not match the individual verification periods.
Calculation method (if applicable)	Not applicable as the data is directly monitored.
QA/QC procedures	For measuring the hourly energy exported to the grid, one main meter and one check meter are maintained. The hourly meter reading of the main meter is the basis of emission reduction calculations, so long as the meter is found to be within prescribed limits of accuracy during the periodic check. The Main Energy Meter and Check Energy Meters accuracy is 0.2s. Hourly meter reading of the check meters would be used for cross checking. The meters are checked for accuracy and calibration by the MSETCL as per the provisions in the power purchase agreement (PPA) prevailing at the time of respective accuracy check or calibration. As per the current PPA, the meters are checked for accuracy every six months and the calibration is done once in a year.
Purpose of data/parameter	Calculation of Project emission
Additional comments	The data would be archived upto two years after the end of crediting period.

Data/Parameter	Diesel Consumption (DC)
Unit	Litre
Description	Diesel consumption by the standby DG set
Measured/calculated/default	Measured
Source of data	Log book
Value(s) of monitored parameter	116

Monitoring equipment	The diesel quantity available in the diesel storage tanks is recorded daily by DLHPPL in the plant log book. The diesel consumption would be recorded in the logbook in litres. However, based on the density of diesel of about $0.88^5$ kg/litre, the diesel consumption in tons would be calculated.
Measuring/reading/recording frequency	Continuously and recorded monthly basis.
Calculation method (if applicable)	Not Applicable
QA/QC procedures	Not Required
Purpose of data/parameter	Calculation of project emission
Additional comments	Project emissions due to diesel consumption will be calculated as below: $PE_{DC,y} = \_DC_y \times NCV_{diesel} \times EF_{CO2\_diesel}$ The data would be archived upto two years after the end of crediting period.

### D.3. Implementation of sampling plan

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Not Applicable.



## SECTION E. Calculation of emission reductions or net anthropogenic removals

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

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The procedures and formulas used for estimation of the baseline emission factor and the assumptions made have been detailed below. The emission reduction of the small scale project activity is the net electricity exported to the grid (EGy) in MWh multiplied by the baseline emission factor in tCO<sub>2</sub>/MWh.

#### Baseline emission factor

The Baseline emission factor (EF) is 0.6890 tCO<sub>2</sub> /MWh has been estimated and validated for Western regional grid of India, the applicable grid for the project activity.

This is fixed ex-ante for the crediting period as per the registered PDD. DLHPPL has exported 62478.00 MWh from the plant in this monitoring period.

Hence, the Baseline Emission is calculated as below;

$$\begin{aligned}\text{Baseline Emissions} &= (0.689 \text{ tCO}_2\text{e/MWh} \times 57,907.20 \text{ MWh}) \\ &= 39,898 \text{ tCO}_2\text{e. (rounded down value has been considered)}\end{aligned}$$

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

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The project emissions<sup>6</sup> for this project activity have occurred due to the following reasons:

Project Emissions on account of Electricity Imported Project Emissions on account of Electricity Imported are calculated as per the equation below:

$$PE_{\text{Import}, y} = E_{\text{Import}, y} \times EF_{\text{grid}, CM, y}$$

Where,

$PE_{\text{Import}, y}$  - Project emissions from import of electricity from the grid during the year y

$E_{\text{Import}, y}$  - Electricity imported from the grid by the project activity during the year y

$EF_y = EF_{\text{Western grid}, CM, y}$  - Baseline Emission Factor for the Western regional grid (Combined Margin Approach) whose value is fixed for the crediting period at 0.689 tCO<sub>2</sub>e/MWh

**Diesel consumption** The project also involved consumption of minor quantity of Diesel in standby DG Set. The formula used to calculate the project emissions due to diesel consumption is provided below:

$$PE_{\text{Diesel}} = \sum DC_y \times \text{Density}_{\text{Diesel}} \times \text{NCV}_{\text{Diesel}} \times EF_{\text{CO}_2\text{Diesel}}$$

Where,

$PE_{\text{Diesel}}$  = Project Emission due to use of Diesel consumed during this monitoring period in DG set

$DC_y$  = Diesel Consumption in Liters (L)

$\text{Density}_{\text{Diesel}}$  = Density of Diesel (0.88Kg/Lit)

$\text{NCV}_{\text{Diesel}}$  = Net Calorific Value of Diesel

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Detailed Calculation is provided in emission reduction calculation sheet.

EF<sub>CO2Diesel</sub> = IPCC 2006 Emission factor for Diesel

$$PE_{\text{Diesel}} = 116 \text{ L} \times (0.88 \times 10^{-3}) \text{ tonne/L} \times 43.3 \text{ GJ/tonne} \times 0.0748 \text{ tCO}_2/\text{GJ} \\ = 0.331 \text{ tCO}_{2e}$$

Thus, total Project Emission,

$$PE_y = PE_{\text{Import},y} + PE_{\text{Diesel},y} \\ = 47.99 + 0.331 = 49 \text{ tCO}_{2e} \text{ (Rounded up value has been considered)}$$

### E.3. Calculation of leakage emissions

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As per category I.D of Appendix B of the simplified M&P for small-scale CDM project activities, leakage is to be considered only if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity. Since this does not apply for the project activity **hence there is no leakage issues associated with the project activity and no formula is used to estimate leakage due to the project activity.**

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

	Baseline GHG emissions or baseline net GHG removals (t CO <sub>2e</sub> )	Project GHG emissions or actual net GHG removals (t CO <sub>2e</sub> )	Leakage GHG emissions (t CO <sub>2e</sub> )	GHG emission reductions or net anthropogenic GHG removals (t CO <sub>2e</sub> )		
				Before 01/01/2013	From 01/01/2013	Total amount
<b>Total</b>	39,898	49	0	0	39,849	39,849

### 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 <sub>2e</sub> )	Amount estimated ex ante (t CO <sub>2e</sub> )
39,849	40,896

### E.6. Remarks on increase in achieved emission reductions

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There is no increase in the emission reductions during the current monitoring period relative to the estimation in the registered CDM-PDD. However, **there is around 2.56% lesser emission reduction** relative to estimation in the registered renewed CDM- PDD for the equivalent duration of the monitoring period. This is envisaged mainly due to the lower PLF because of no-generation months during the monitoring period.

## Annex 1

Technical specification of BH-1:

The power plant consists of water conductor, intake, power house, generation unit and a transformer.

<b>Bhandardara reservoir</b>	
Type of dam	Masonry gravity dam
Gross storage	318 million cubic meter (Mm <sup>3</sup> )
Live storage for power	249 Mm <sup>3</sup>
Top of dam	746.04 m
<b>Water conductor</b>	
Number	1
Type	Steel
Design discharge	24 m <sup>3</sup> /s
Size	3.0 m dia
Length	318.8 m
<b>Intake</b>	
Full supply level	744.73 m
Minimum draw down level for power	720.7 m
<b>Power house</b>	
Type	Surface, RCC and masonry
Size	21.5 m x 29.25 m
Floor level	674.15 m
Level of CL of turbine	665.5 m
Capacity of OH crane	65/15 tonnes
<b>Turbine unit</b>	
Max gross head	77 m
Net design head	69 m
Design discharge	19.25 m <sup>3</sup> / sec
Type of generating unit	Vertical, Francis, top mounted thrust bearing
Number	1
Installed capacity	12.564 MW
Excitation	Static
Serial No.	V – 0037/1
<b>Generator unit</b>	
Guaranteed output	12 MW
Rated power factor	0.9
Efficiency at 0.9 power factor	97.62 % at 100 % load

**Details of Energy Meters & their calibration due dates:**

	<b>Gross Generation Meter</b>	<b>Export Main Meter</b>	<b>Export Check Meter</b>
Make	Siemens Landis & Gyr Z.U	ABB	ABB
Accuracy Class	0.2s	0.2s	0.2s
Serial Number	73932341	2173601	2173600
Calibration Frequency	Once in a year	Once in a year	Once in a year
Date of Previous Calibration	08/06/2016	05/06/2015	05/06/2015
Meter Replacement Date	Not Replaced	30/11/2015	30/11/2015
		<b>New Meter</b>	<b>New Meter</b>
Make		Elester	Elester
Accuracy Class		0.2	0.2
Serial Number		14831461	14831477
Calibration Frequency		Once in a year	Once in a year
Date of recent testing	08/06/2016	03/06/2016	03/06/2016

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**Document information**

<i>Version</i>	<i>Date</i>	<i>Description</i>
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN);</li> <li>• Make editorial improvements.</li> </ul>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to the Host Party;</li> <li>• Remove reference to programme of activities;</li> <li>• Overall editorial improvement.</li> </ul>
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));</li> <li>• Include provisions related to standardized baselines;</li> <li>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;</li> <li>• Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>;</li> <li>• Editorial improvement.</li> </ul>
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.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		