Monitoring report form for CDM project activity
(Version 08.0)

MONITORING REPORT			
Title of the project activity	Small Hydro Power Project in Panwi, Himachal Pradesh.		
UNFCCC reference number of the project activity	10183		
Version number of the PDD applicable to this monitoring report	Registered PDD Version 03 (dated 23/06/2015)		
Version number of this monitoring report	01		
Completion date of this monitoring report	05/06/2021		
Monitoring period number	04 (of the 1st crediting period)		
Duration of this monitoring period	01/04/2019 – 31/12/2020 (Inclusive of both the dates)		
Monitoring report number for this monitoring period	01		
Project participants	▪ Ascent Hydro Projects Ltd (AHPL) ▪ WeAct Pty Ltd.		
Host Party	India		
Applied methodologies and standardized baselines	Methodology: AMS-I.D. - Grid connected renewable electricity generation, version 18; Dated: 27/11/2014 Standard baseline: Not Applicable		
Sectoral scopes	01, Energy Industries (renewable/non-renewable sources)		
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013 until 31 December 2020	Amount achieved from 1 January 2021
	NA	35,132[1] tCO_2e	NA
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	36,537[2] tCO_2e		

[1] Detailed Calculation provided in Emission Reduction (ER) calculation excel sheet.
[2] Refer section E.5.1. Detailed calculation has been provided in ER sheet.

SECTION A. Description of project activity

A.1.

A.2. General description of project activity

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The project serves the purpose of producing clean electrical energy in a sustainable manner. The project activity involves implementation of 4 MW (2*2000 KW) hydro turbines which utilize the potential energy available with water for power generation.

Brief description of the installed technology and equipment:

This run of river small scale hydropower project that utilizes the water of Panwi Gad, a tributary of Sutlej River in Kinnaur District of Himachal Pradesh in India. The water from the stream is diverted by means of a trench weir. The diverted water from the stream is conducted by means of a water conductor system into the forebay tank. Water then leaves the forebay and is guided by penstock into the power house. The power house contains 2 nos. of Pelton Wheel type, horizontal shaft turbines and synchronous generators with alternating current to generate electrical energy. The two units have a longitudinal arrangement parallel to the length axis of the power house.

The project activity is promoted by Ascent Hydro Projects Limited (AHPL). Power generated from the project activity is sold to "Himachal Pradesh State Electricity Board (HPSEB)" through "Northern, Eastern, Western, and North-Eastern" (NEWNE) regional grid.

The details of the technology and equipment's are listed in the Appendix 1.

Relevant dates for the project activity:

The project activity has been commissioned on 09/05/2013. The project activity has been registered with UNFCCC on 15/08/2015 with renewable crediting period. The duration of the first crediting period is from 15/08/2015 to 14/08/2022. The first monitoring period was from 15/08/2015 to 31/08/2016 which has been completed successfully and resulted in emission reduction of 16,855 tCO_2e. Second monitoring period was from 01/09/2016 to 31/12/2017, the project has achieved emissions reduction of 21,812 tCO_2e. Third monitoring period was from 01/01/2018 to 31/03/2019, the project has achieved emissions reduction of 17,273 tCO_2e.

Emission reductions achieved in the 4th monitoring period of 1st Crediting Period:

During the current monitoring period i.e., 01/04/2019 to 31/12/2020 (inclusive of both the dates), the project has achieved emissions reduction of 35,132 tCO_2e.

A.3. Location of project activity

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The project activity is located as follows:

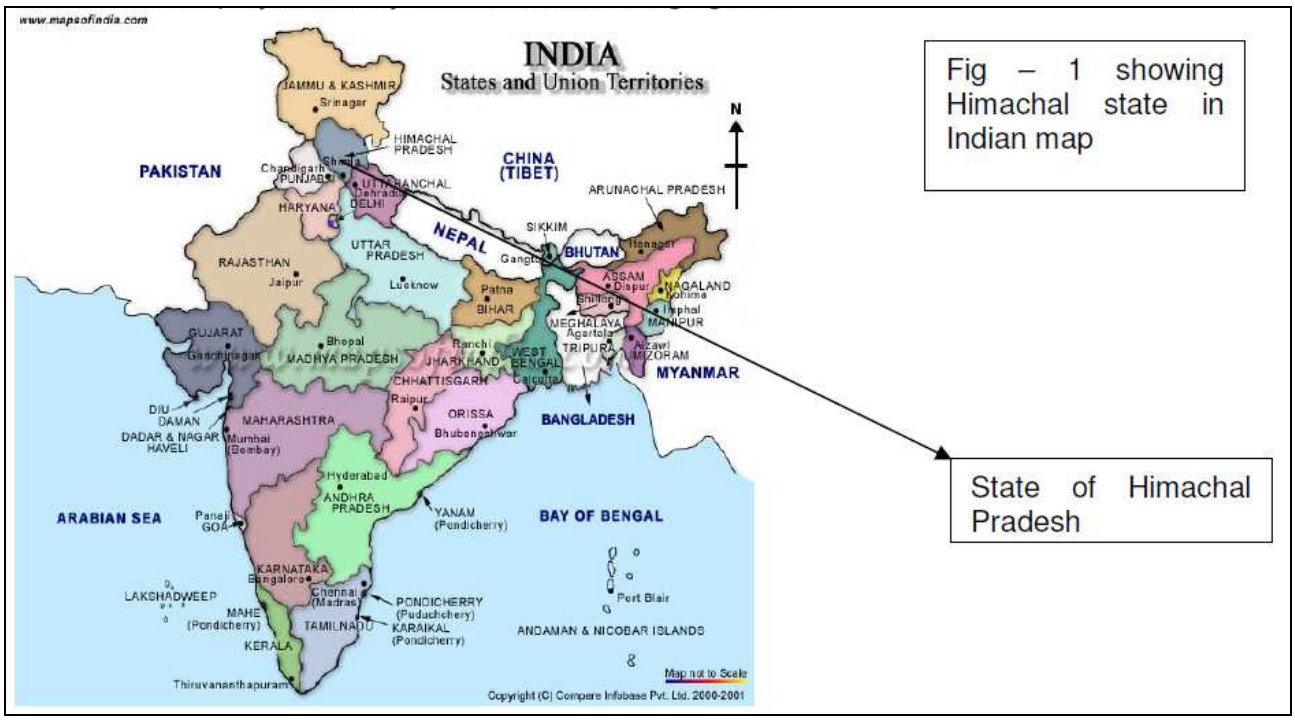
Panwi Village is in Kinnaur district, Himachal Pardesh, India.

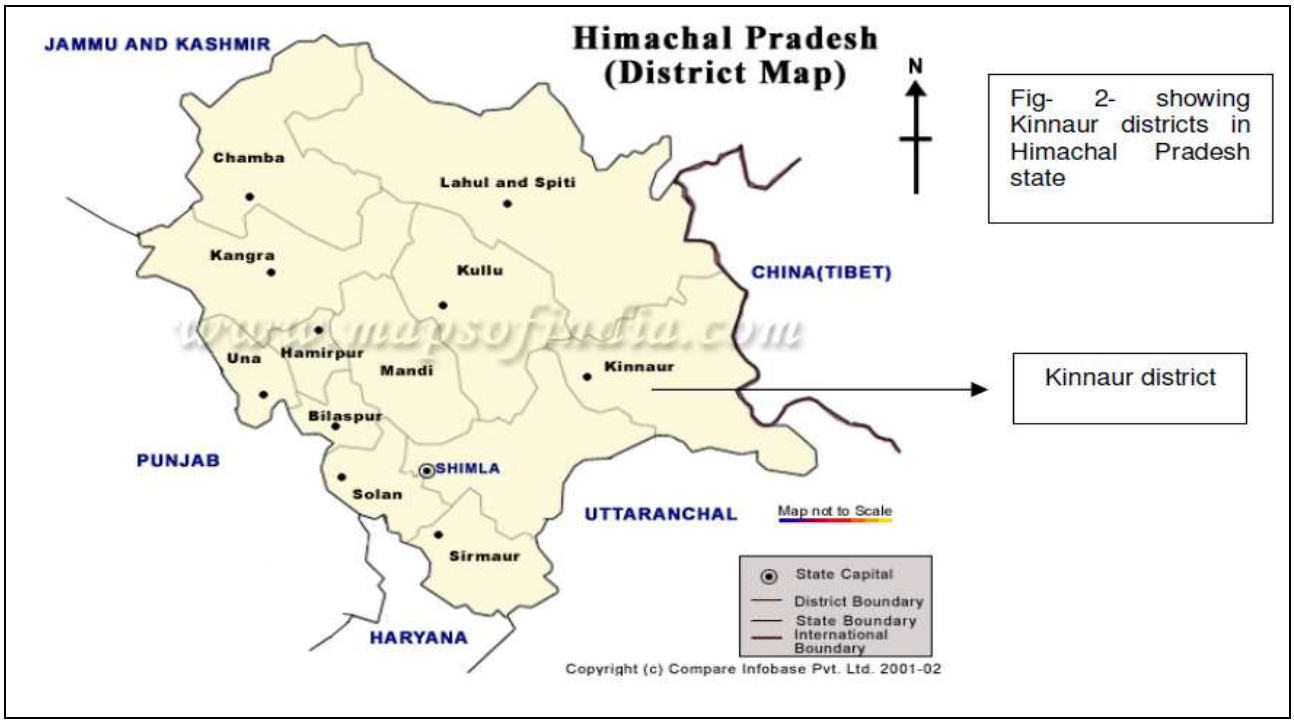
Longitude 78 º 01' 30" E
Latitude 31 º 32' 00" N

Nearest big town and distance Rampur, 61 kilometers distance from state capital, Shimla 155 kilometers.

The project is accessible by National Highway (NH)-22 which runs from Shimla to Tibet. The nearest town is Shimla. Kalka is the nearest main railway station and is about 80 kilometres from Shimla.

The location of project activity is shown in following figures.





A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	Ascent Hydro Projects Ltd. (AHPL) (Private Entity)	No
Australia	WeAct Pty Ltd. (Private Entity)	No

A.5. References to applied methodologies and standardized baselines

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Approved baseline and monitoring methodology:

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[3] (EB 81, Annex 24 dated 28/11/2014)
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.

Tools referenced in this methodology:

"Tool to calculate the emission factor for an electricity system", Version 04.0 EB 75, Annex 15, dated 04/10/2013
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" - Version 02, EB41, Annex 11, dated 02/08/2008
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

Standardized baseline: Not applicable.

A.6. Crediting period type and duration

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

Start date of the 1st Crediting Period	: 15/08/2015
End date of the 1st Crediting Period	: 14/08/2022
Duration of the Current Monitoring Period	: 01/04/2019 – 31/12/2020

[3] https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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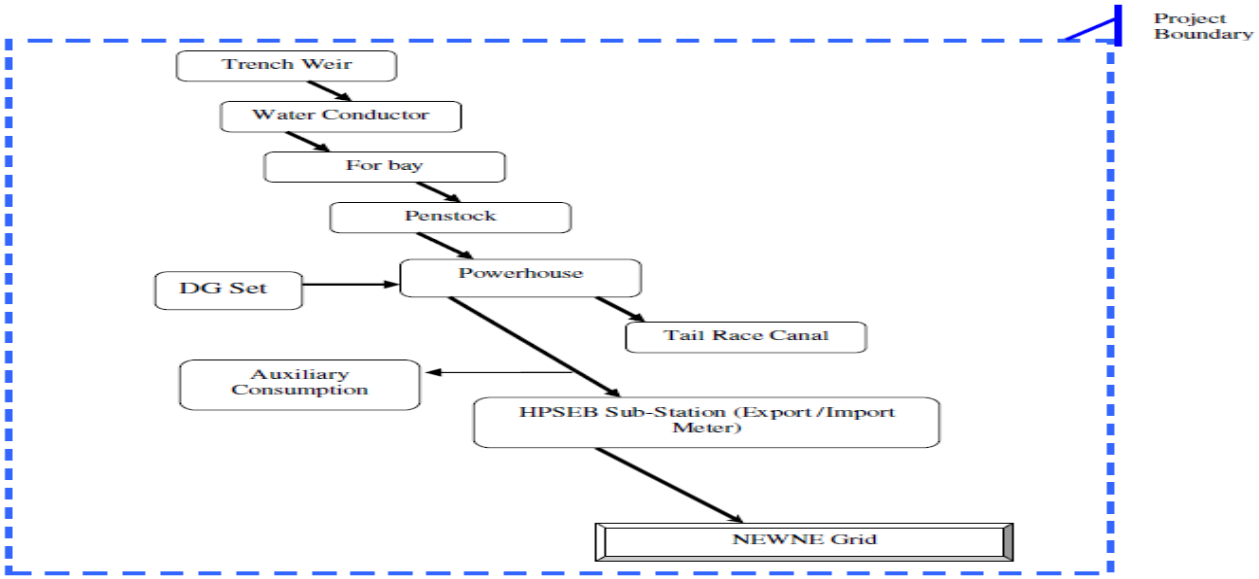
The project activity[4] is a small hydropower projects supplying electricity to the Himachal Pradesh grid, part of northern regional grid integrated in Northern Eastern Western and North Eastern (NEWNE) grid, which is being supplied by several fossil fuels generating units. The emission reductions of the project activity arise from net electricity exported to the grid. The project activity consists of run-of-the-river hydropower plants generating electricity from a renewable source of energy. In the absence of the project activity, equivalent amount of electricity would have been produced from other sources of energy such as fossil fuels comprising the Northern Eastern Western and North Eastern (NEWNE) grid which would have released greenhouse gases into the atmosphere.

For the project activity, the project boundary is from the point of water tapping to the point of electricity supply to the grid interconnection point. Thus, the project boundary is as follows:

- Trench weir
- Water conductor
- Fore bay
- Penstock
- Powerhouse
- Tail race canal
- Transmission line to grid connection
- Grid interface

The project boundary also includes a stand-by diesel generator (DG) set which is operated only as a failsafe option or stand by power requirements in case the power plant is not operating. The North Eastern (NEWNE) regional grid is included in the project boundary.

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 which may change the applicability of the methodology or change the emission reductions. Further, the plant was in continuous operation during the monitoring period.

[4] Details of technology employed is provided in Appendix 1

B.2. Post-registration changes

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

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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 methodological regulatory documents

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Not Applicable

B.2.6. Changes to project design

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Not Applicable

B.2.7. Changes specific to afforestation or reforestation project activity

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Not Applicable

SECTION C. Description of monitoring system

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The general principles for monitoring above parameters are based on:

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

Frequency

Monthly joint meter reading (JMR) of main meters installed at the substation are taken and signed by authorised officials of AHPL and HPSEB. Daily data recording by the shift in-charge of AHPL are available at the generation end and interconnection point. JMR are the basis for monthly invoice of net energy exported to the grid.

Data recording

Records of the monthly joint meter reading of net energy exported to the grid are maintained by AHPL and HPSEB. Daily and monthly reports stating the generation, auxiliary consumption, total electricity export and import, diesel consumption are prepared by the shift in-charge in AHPL.

Reliability

For measuring the net energy exported to the grid, one main meter and one check meter is maintained. Main meter reading is the basis of billing and emission reduction calculations. During this monitoring period the meter is found to be within prescribed limits of accuracy during half yearly check. Monthly JMR of main meters are taken and signed by authorised officials of AHPL and HPSEB once in every month. Records of the JMR are maintained by AHPL and HPSEB.

Procedure for data uncertainty:

The main and check meter are test/checked for accuracy every six months and sealed by HPSEB in presence of representative of AHPL. The calibration of meters is as per IS standards. Both main (billing) and check meters have separate set of CT/PT units to avoid chances of both going out of order simultaneously.

The calibration schedule is not under the direct control of PP and it is solely controlled by State Electricity Board, i.e., HPSEB. The HPSEB has conducted the annual calibration of all energy meters by third party laboratory (NABL accredited). Therefore, all energy meters which are calibrated have their validity of calibration as one year as per the NABL certified Lab. But PP has adopted & following the six-monthly calibration validity period throughout the current monitoring period. Therefore, the set of calibrated energy meters (set of main & check) were ultimately replaced & used in every six months period, so the energy meter replacement frequency is to be considered as actual calibration frequency which is exactly followed at project site and hence in this way the requirement of calibration frequency is met by the PP as per the section B.7.1 & B.7.2 of the registered PDD (version 03, dated: 23/06/2015).

Therefore, all energy meters were calibrated throughout the current monitoring period. However, there are delays against half yearly calibration validity of energy meters & replacement which has happened in the month of Jun 2019, Jan 2020 and Jul 2020 (as per HPSEB procedure). But, as per the prevailing practice the set of energy meters (i.e., main & check meter) HPU05976 and HPU05977 is replaced with other set of calibrated energy meters X0377326 & X0377327 (i.e., main & check) in the set frequency of six months. These delays in meters calibration and replacement are evident from the table given under Appendix 2. Therefore, PP has applied the

maximum permissible error for the whole month of Jun 2019 & Jul 2019, Jan 2020 and Jul 2020 to Nov 2020 in line with the VVS (Version 2) para 366a.

Thus, practically the frequency of meter replacement becomes the validity/frequency of meter calibration; hence the requirement of calibration frequency is met as per the registered PDD. Thus, there is no delay in calibration experienced during the entire monitoring period.

Also, as per section B.7.2 of the registered PDD (version 03, dated: 23/06/2015), if during half yearly test checks, the main meter and check meter are both found to be beyond permissible limits of error, then both meters shall be replaced with calibrated meters by PP under the supervision of HPSEB. All the tests on the main and check meters shall be conducted by the electricity authority in presence of the representatives of project proponents.

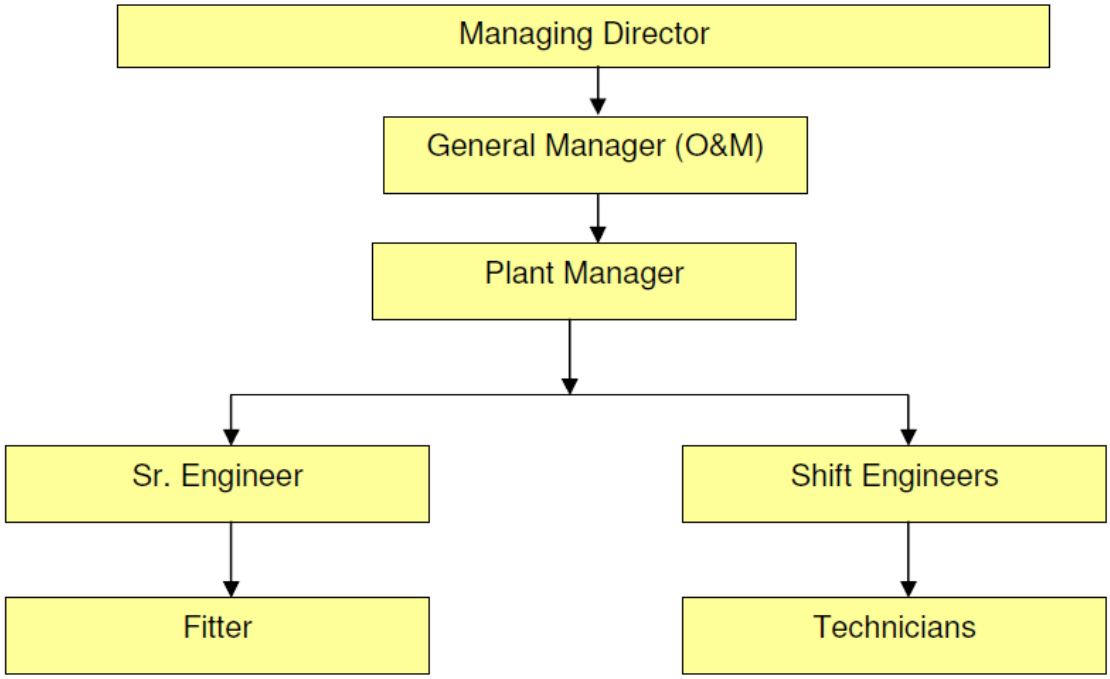
Data archiving and safe storage responsibility:

AHPL archives and preserves all the monthly invoices raised against net saleable energy parameters. Managing director and Plant Manager shall be responsible for the safe storage of the archived data.

Interruptions:

Number of tripping due to grid failure shall be recorded. Logbook record sample is provided in Appendix 3.

The operational and management structure of the project activity is given below:



Managing Director of AHPL is based in head office in Pune, Maharashtra state, India and periodically visits the plant. A Shift engineer shall be available in each shift. Shift engineers are involved in operation and maintenance of hydroelectric plants and are assisted by technicians. Senior Engineer shall be assisted by a fitter who shall be responsible for on-site maintenance of the equipment, preventive maintenance etc.

Monitoring measurements and reporting:

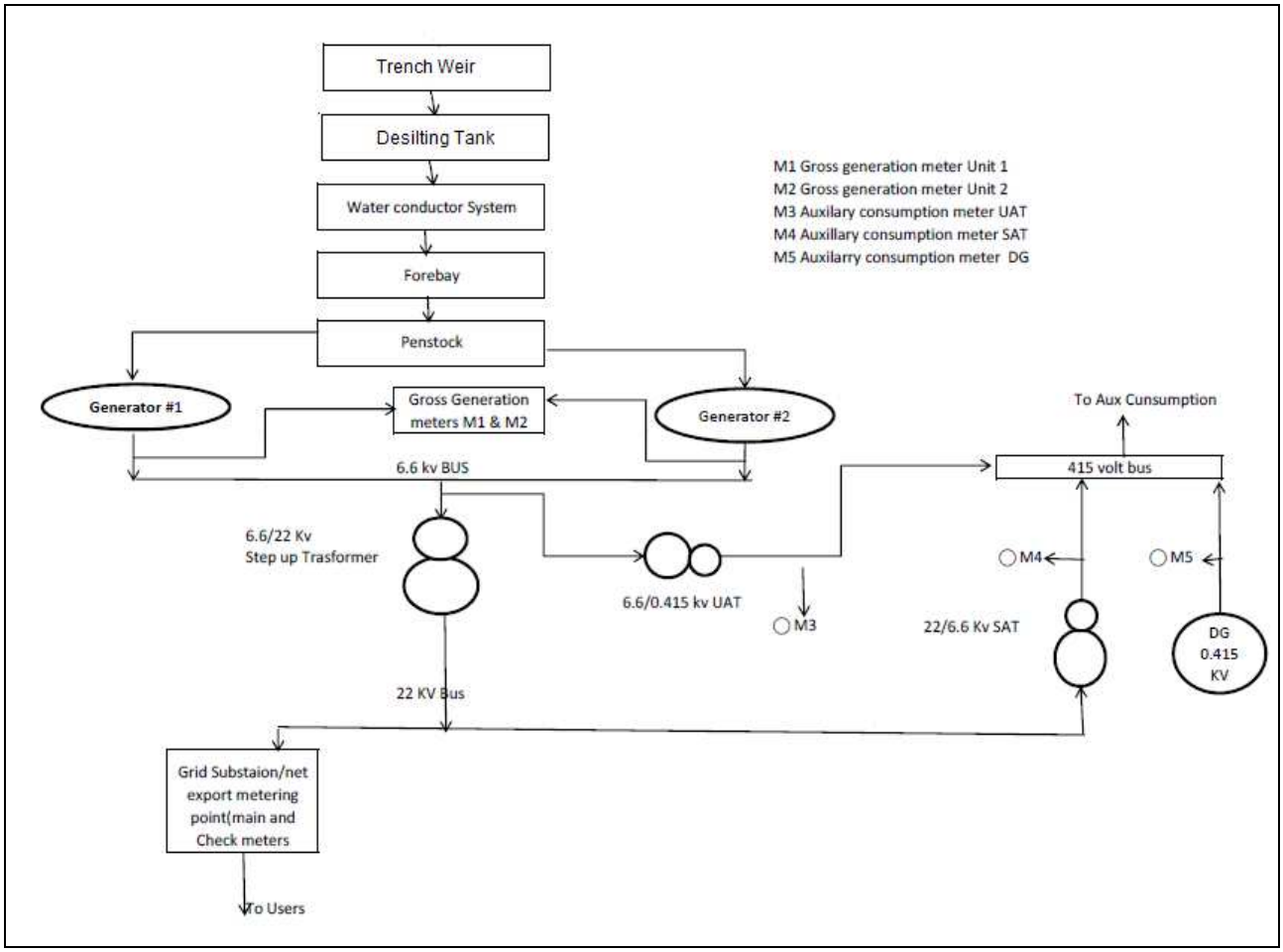
The shift engineer records the readings from main meter and check meter daily and these readings are counter-checked by the Plant Manager. Daily reports are sent to respective head office electronically and Monthly reports are generated and maintained at the plant and head office.

Records of JMR are maintained by Plant Manager. Monthly invoices are prepared based on JMR which can be cross checked from the payment received against the invoice.

Procedures for maintenance of monitoring equipment and installations:

In the context of the identified project activity, energy meter is the only equipment which is required to track the monitoring parameters as per the registered monitoring plan. As per the power purchase agreement (PPA) with HPSEB, the energy meters and the meter boxes are owned and kept sealed by the HPSEB and hence shall be maintained by HPSEB.

Schematic line diagram of the monitoring points:



Procedure for internal audits & project performance review:

The internal audit team comprises Managing Director, General Manager (OM), Plant Manager and Engineer of AHPL. The internal audit is conducted once in a year. The internal audit team is responsible for the review and follow-up of corrective actions.

Procedure for data apportioning:

In the event when the verification period dates and billing cycle dates (JMR dates) do not coincide, daily export and import reading from main and check meter would form the source of emission reduction calculation for that period. The daily export and import readings are taken manually from the main and check meter on monthly basis in the presence of representative of AHPL and HPSEB. The method of calculation is considered as per the registered monitoring plan and is as explained below:

For example, if the JMR date is 30th of a month whereas the crediting period starts on 25th of that month. The net energy supplied to the grid will be calculated as below:

Export reading on 30th	X
Export reading on 25th	Y
Total export between 25th to 30th	Z = X –Y

Import reading on 30th	A
Import reading on 25th	B
Total import between 25th to 30th	C =A – B

Net electricity supplied between 25th to 30th E= Z – C

All the monitored data will be archived for at least two years after end of the crediting period. The monitoring period starts from 01 Apr 2019 whereas billing cycle starts from 31st of one month to 31st of every next month which comprises a month record. Thus, procedure for data apportioning as explained above is not required for the current monitoring period.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,CM,y}$ = $EF_{grid,y}$
Unit	tCO_2/MWh
Description	Combined margin CO2 emission factor for the project electricity system in year y
Source of data	Central Electricity Authority (CEA), CO2 baseline database, Version 8.0, January 2013
Value(s) applied	0.944
Choice of data or measurement methods and procedures	This value is the combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) and calculated according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system". (Version 04.0) The database is Government of India's official publication; CEA has estimated the baseline emission factor for the NEWNE Grid based as per applicable EB guidance.
Purpose of data/parameter	Calculation of baseline emission.
Additional comments	Fixed for entire crediting period

Data/Parameter	$EF_{grid,OM,y}$
Unit	tCO_2/MWh
Description	Operating margin CO2 emission factor for the project electricity system in year y
Source of data	Central Electricity Authority (CEA), CO2 baseline database, Version 8.0, January 2013
Value(s) applied	0.972
Choice of data or measurement methods and procedures	Simple OM method (Option a) is used for the calculation; calculated as per the weighted average emissions (in tCO2/MWh) (3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD (Version 03, dated: 23/06/2015) to the DOE for validation.) (2009-10, 2010-11, 2011-12.) The database is Government of India's official publication; CEA has estimated the baseline emission factor for the NEWNE Grid based as per applicable EB guidance.
Purpose of data/parameter	Calculation of baseline emission.
Additional comments	Fixed for entire crediting period

Data/Parameter	$EF_{grid,BM,y}$
Unit	tCO_2/MWh
Description	Build margin CO2 emission factor for the project electricity system in year y
Source of data	Central Electricity Authority (CEA), CO2 baseline database, Version 8.0, January 2013
Value(s) applied	0.916

Choice of data or measurement methods and procedures	Option 1 in Step5 of "Tool to calculate the emission factor for an electricity system" is used for the calculation of Build Margin emission factor. The database is Government of India's official publication; CEA has estimated the baseline emission factor for the NEWNE Grid based as per applicable EB guidance.
Purpose of data/parameter	Calculation of baseline emission.
Additional comments	Fixed for entire crediting period

Data/Parameter	P
Unit	kg/ltr
Description	Density of diesel
Source of data	http://www.fast-tek.com/TM104.pdf http://www.iocl.com/Products/DieselSpecifications.pdf
Value(s) applied	0.860
Choice of data or measurement methods and procedures	Fixed Value has been taken from the publicly available data source.
Purpose of data/parameter	Calculation of project emission
Additional comments	-

Data/Parameter	**$EF_{CO2,diesel,y}$**
Unit	tCO_2/TJ
Description	CO_2 emission factor of diesel in year y
Source of data	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value(s) applied	74.8
Choice of data or measurement methods and procedures	Fixed value taken from publicly available source
Purpose of data/parameter	Calculation of project emission
Additional comments	This parameter is fixed ex-ante for the entire crediting period

Data/Parameter	**$NCV_{diesel,y}$**
Unit	GJ/ton
Description	Net Calorific Value of the diesel
Source of data	Taken from Central Electricity Authority website (Data on Petroleum Fuels used by various Gas Turbines & Diesel Engine Power Plants in the Country during 2003-04).
Value(s) applied	42.25
Choice of data or measurement methods and procedures	Fixed Value has been taken from the publicly available data source. http://www.cea.nic.in/reports/articles/thermal/data_petroleum_fuels.pdf
Purpose of data/parameter	Project emission calculation
Additional comments	This parameter is fixed ex-ante for the entire crediting period

D.2. Data and parameters monitored

Data/Parameter	$EG_{BL,y}$
Unit	MWh
Description	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y
Measured/calculated/ default	Calculated
Source of data	Monthly Joint Meter Reading (JMR)
Value(s) of monitored parameter	37,219[5]
Monitoring equipment	Value has been calculated from the Energy export and Import values, which are recorded in the main & check meters.
Measuring/reading/recording frequency	Monthly
Calculation method (if applicable)	$EG_{BL,y} = EG_{Export} – EG_{Import}$ The calculated value of this parameter is indicated in the JMR which is prepared by HPERC as per PPA. Quantity of net electricity supplied to the grid in year y is the difference between the measured quantities of the grid export and import.
QA/QC procedures	This figure can be cross verified using the Invoices raised by the company and also from the payment received by the company from HPSEB for the month.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	AHPL shall archive all the JMRs and plant record books pertaining to the electricity exported for at least two years after the end of the crediting period.

Data/Parameter	EG_{Export}
Unit	MWh
Description	Total electricity export to the grid by the project activity in year y
Measured/calculated/ default	Measured
Source of data	Monthly Joint Meter Reading (JMR)
Value(s) of monitored parameter	37,228.16[6]
Monitoring equipment	Value has been taken from records of the main & check meters. The details of the energy meter have been provided in Appendix 2
Measuring/reading/recording frequency	The parameter is monitored continuously on a real time basis[7] and recorded monthly basis

[5] Detailed Calculation provided in Emission Reduction (ER) calculation excel sheet.

[6] Month-wise details are provided in Emission Reduction (ER) calculation excel sheet.

[7] Electricity export and import values are monitored on a continuous basis through dedicated energy meter of 0.2s accuracy class installed at grid substation. The export and import values are measured automatically on a real time basis which ensures hourly measurement as per requirement of the methodology.

Calculation method (if applicable)	Data Type: Measured: The units exported are measured at the main meter[8] and check meter at the substation interconnection point. Monthly joint meter reading of main meters installed at the substation shall be taken and signed by authorised officials of AHPL and HPSEB. Joint meter reading shall be the basis for monthly invoice of net energy exported to the grid. Data Archiving: Paper/ Electronic; Records of the joint meter reading of net energy exported to the grid shall be maintained by AHPL. Daily and monthly reports stating the net power export shall be prepared by the shift in-charge and verified by the plant manager of AHPL. Calibration Frequency: Once in every 6 months.
QA/QC procedures	For measuring the net energy exported to the grid, one main meter and one check meter, of accuracy class 0.2s, are maintained. Main meter reading is the basis of billing and emission reduction calculations, as the meter is found to be within prescribed limits of accuracy during the test. As per the PPA, the calibration of meters shall be done in every six months. Both main and check meters have separate set of CT/PT units to avoid chances of both going out of order simultaneously.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	AHPL shall archive all the JMRs and plant record books pertaining to the electricity exported for at least two years after the end of the crediting period

Data/Parameter	**EG_{Import}**
Unit	MWh
Description	Total electricity imported from the grid by the project activity in the year y
Measured/calculated/ default	Measured
Source of data	Monthly Joint Meter Reading (JMR)
Value(s) of monitored parameter	8.91[9]
Monitoring equipment	Value has been taken from records of the main & check meters. The details of energy meter have been provided in Appendix 2.
Measuring/reading/recording frequency	The parameter is monitored continuously on a real time basis[10] and recorded monthly basis

[8] There is no delay identified in maintaining the calibration frequency of energy meter. Meter accuracy class, meter calibration & replacement details are provided in Appendix-2.

[9] Month-wise details are provided in Emission Reduction (ER) calculation excel sheet.

[10] Electricity export and import values are monitored on a continuous basis through dedicated energy meter installed at grid substation. The export and import values are measured automatically on a real time basis which ensures hourly measurement as per requirement of the methodology.

Calculation method (if applicable)	Data Type: Measured: The units imported is measured at the main meter and check meter at the interconnection point at the substation. Monthly joint meter reading of main meters installed at the substation shall be taken and signed by authorised officials of AHPL and HPSEB. Joint meter reading shall be the basis for monthly invoice of net energy exported to the grid. Data Archiving: Paper/ Electronic; Records of the joint meter reading of net energy exported to the grid shall be maintained by AHPL. Daily and monthly reports stating the net power export shall be prepared by the shift in-charge and verified by the plant manager of AHPL. Calibration Frequency: Once in every 6 months.
QA/QC procedures	For measuring the net energy exported & Import, one main meter and one check meter, of accuracy class 0.2s, is maintained. Main meter reading is the basis of billing and emission reduction calculations, so long as the meter is found to be within prescribed limits of accuracy during half yearly check. As per the PPA, the calibration of meters shall be done in every six months. Both main and check meters have separate set of CT/PT units to avoid chances of both going out of order simultaneously.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	AHPL shall archive all the JMRs and plant record books pertaining to the electricity exported for at least two years after the end of the crediting period

Data/Parameter	DC_y
Unit	Litres
Description	Diesel consumption by the standby DG set in year y
Measured/calculated/ default	Calculated
Source of data	Plant log book
Value(s) of monitored parameter	661[11]
Monitoring equipment	The diesel quantity available in the diesel storage tanks is recorded daily by AHPL 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 0.86 kg/litre, the diesel consumption in tons would be calculated.
Measuring/reading/recording frequency	Continuously and recorded monthly basis.

[11] Month-wise details are provided in Emission Reduction (ER) calculation excel sheet.

Calculation method (if applicable)	Data Type: Measured & Calculated 1) The diesel quantity available in the diesel storage tanks is recorded as initial and final reading as and when used on the basis of level gauge by AHPL in the plant log book. 2) AHPL also maintain the record of DG set running hours and the kWh generated by the DG set. 3) The level gauge has marking of 10 lit (Least Count) up to the 300 Lit (Total Capacity of diesel tank) which is calibrated manually every year. The Level Gauge of DG set is a standard scale and mounted inside the cap of fuel tank. Annually, the calibration of level gauge is carried out by checking the standard marking of 10 Lit (Least Count) up to the 300 Lit (Total Capacity of diesel tank) and comparing the level of tank by filling the measured quantity of Diesel (litre as mentioned in purchase receipt) in to tank. The records of filling of tank is maintained in DG set log book at Project site. 4) The diesel consumption would be recorded in the plant logbook in litres. The values are converted to tons using a factor 0.86 kg/litres (density of diesel), for the purpose of calculation. 5) The diesel is consumed only in the rare situation only when the power plant is not operational. 6) This value is used for project emission calculation. Data Archiving: Paper/ Electronic.
QA/QC procedures	The measured data can be cross checked with total diesel procurement using payment receipts.
Purpose of data/parameter	Calculation of project emission.
Additional comments	The data would be archived up to 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 baseline emissions are the product of electrical energy baseline EGBL, y expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

$BE_y = EG_{BL,y} \times EF_{CO2, grid, y}$

Where:

BE_y : Baseline Emissions in year y (tCO_2)

$EG_{BL, y}$: Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{CO2 ,grid,,y}$: CO_2 emission factor of the grid in year y (tCO_2e/MWh)

Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (EGBL,y) is equal to total electricity exported to the grid (EG_{Export}) minus total electricity imported from the grid (EG_{Import}).

Thus, $EG_{BL,y} = EG_{Export} - EG_{Import}$

= (37,228.16 – 8.91) MWh

= 37,219.25 = 37,219 MWh (rounded down value)

Therefore,

$BE_y = EG_{BL,y} \times EF_{CO2, grid, y}$

= 37,219 × 0.944 tCO_2e

= 35,134 tCO_2e (rounded down conservatively)

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

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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:

$PE_{Diesel} = \sum DC_y \times P \times NCV_{Diesel} \times EF_{CO2Diesel}$

Where:

PE_{Diesel} : Project emission due to diesel consumed during this monitoring period in DG set
DC_y : Diesel consumption in Liters (L)
P : Density of diesel (0.86 kg/lit)
NCV_{Diesel} : Net calorific value of diesel
$EF_{CO2Diesel}$: IPCC 2006 Emission factor for diesel

PE_{Diesel} = 661 L × (0.86 × 10^-3) tonne/L × 42.25 GJ/tonne × 0.0748 tCO_2/GJ
= 1.797 tCO_2e
= 2 tCO_2e (rounded-up conservatively)

E.3. Calculation of leakage emissions

>>
As per paragraph 22 of AMS-I.D. version-18, 'If the energy generating equipment is transferred from another activity, leakage is to be considered.' In the project activity, there is no transfer of energy generating equipment and therefore the leakage from the project activity is considered as zero. That is $LE_y = 0$.

Thus, $ER_y = BE_y – PE_y – LE_y$

Where:
ER_y Emission reductions in year y (tCO_2/y)
BE_y Baseline Emissions in year y (tCO_2/y)
PE_y Project emissions in year y (tCO_2/y)
LE_y Leakage emissions in year y (tCO_2/y)

Hence, ER_y = 35,134 – 2 – 0 tCO_2e
= 35,132 tCO_2e

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

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)			
				Before 01/01/2013	From 01/01/2013 until 31/12/2020	From 01/01/2021	Total amount
Total	35,134	2	0	0	35,132	0	35,132

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

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante for this monitoring period in the PDD (t CO_2e)
35,132	36,537

E.5.1. Explanation of calculation of "amount estimated ex ante for this monitoring period in the PDD"

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As per registered CDM-PDD (version 03, dated: 23/06/2015) page 1, the annual estimated volume of CERs is 20,812 tCO_2e. The total nos. of days included in this monitoring period (i.e. 01/04/2019 to 31/12/2020, inclusive of both the days) = 641. Thus, to calculate the ex-ante estimated value of ER corresponding to this monitoring period, the annual estimated ER value (as per registered PDD) has been extrapolated for the equivalent period, i.e. 641 days, which results in 36,537[12] tCO_2e. Whereas actual ER achieved is 35,132 tCO_2e. The detailed calculation has been provided in ER calculation sheet.

E.6. Remarks on increase in achieved emission reductions

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[12] Ex-ante estimated annual ER as per registered PDD = 20,812; = 20,812/365 = 57 tCO_2e per day.
Ex-ante estimated value corresponds to this monitoring period = 57 × 641 = 36,537 tCO_{2e}.

It is evident that there is no increase in the actual emission reductions achieved during the current monitoring period as compared to the projected emission reduction for the comparable period. However, there is around 3.85% [13] lesser emission reduction achieved during the current monitoring period as compared to the projected ERs of equivalent period, which is mainly due to the lower PLF achieved during the current monitoring period.

E.7. Remarks on scale of small-scale project activity

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The project activity is a Type-I category small scale 4 MW small scale hydropower comprise of two units of 2 MW hydroelectric project and there is no change in the rated capacity of project activity has happened during this monitoring period and crediting period which may lead to the change in the scale of project activity.

[13] Please refer ER calculation sheet for detailed calculation.

Appendix - 1

Number of Turbines	2
Type	Impulse – Pelton
Number of Jet	Double Jet
Rated output	2000 kW
Rated head	163.5 m
Nominal discharge	1.42 cumecs
Maximum pressure rise	25%
Maximum speed rise	30%

Number of Generators	2
Rated output	2000 kW
Power factor	0.9
Rated voltage	3.3 ±10%
Frequency	50Hz
Range of frequency variation	± 3%
Number of phases	3, star connected

Description	**Panwi SHP**
Installed capacity	4.0 MW
Trench weir Design discharge Elevation	 3.48 m^3/s 1784.0 m
Intake to desilting tank Design discharge Length	 3.48 m^3/s 228 m
Desilting tank to forebay Design discharge Length	 2.9 m^3/s 1084 m
Capacity of Forebay Top level of Forebay	450 m^3 1779.5 m
Penstock Number	 1

Description	Panwi SHP
Length and size	280 m of 1.0 m diameter
Number of generating units	2
Capacity of each unit	2.0 MW
Generator floor level	1611 m
Gross head	168.5 m
Net head design	163.5 m
Voltage	22 kV
Connection to grid	Nathpa substation at a distance of 4.5 kilometres
Project Life time[2]	35 Years

Appendix - 2

Details of Energy Meters & their calibration due dates:

Make	Secure	Secure
Type	E3M024	E3M024
PT Ratio	22KV/√3/110V/√3	22KV/√3/110V/√3
CT ratio	150/1A	150/1A
Accuracy Class	0.2s	0.2s
Sr. No.	**HPU05976**	**X0377326**
	HPU05977	**X0377327**

Year	Date of Calibration	Meter with Sr. No. as Installed	Installation date	Meter with Sr. No. is Removed	Valid up to	Delays in replacement (if any)
Jun-19	18.06.2019	X0377326 (Main meter)	06.07.2019	HPU05976 (Main Meter)	05.01.2020	17 days delay
	18.06.2019	X0377327 (Check meter)	06.07.2019	HPU05977 (Check Meter)	05.01.2020	17 days delay
Jan-20	03.01.2020	HPU05976 (Main Meter)	07.01.2020	X0377326 (Main meter)	06.07.2020	02 days delay
	03.01.2020	HPU05977 (Check Meter)	07.01.2020	X0377327 (Check meter)	06.07.2020	02 days delay
Nov-20	10.11.2020	X0377326 (Main meter)	11.11.2020	HPU05976 (Main Meter)	10.05.2021	128 days delay
	10.11.2020	X0377327 (Check meter)	11.11.2020	HPU05977 (Check Meter)	10.05.2021	128 days delay

Please note that meter calibration & replacement is solely under the control of State Electricity Board, i.e., HPSEB, PP has no control over it. However, it is observed that there are delays in meter calibration & replacement during the monitoring period.

These are -

a) there is delay of 17 days in six-monthly meter replacement/calibration frequency in the month of Jun 2019.
b) there is delay of 2 days in six-monthly meter replacement/calibration frequency in the month of Jan 2020.
c) there is delay of 128 days in six-monthly meter replacement/calibration frequency in the month of Jul 2020.

As HPSEB has control over calibration and replacement, delays counted under point (a) and (b) are on their behalf. Even though calibration validity of the meters is for one year, PP has applied maximum permissible error for the whole month i.e., for (a) in month of Jun 2019 and Jul 2019 and for (b) in the month of Jan 2020 in line with the VVS (Version 02) Para 366a.

Further, delay in the month of Jul 2020 i.e., option (c) was pertaining to the COVID-19 pandemic situation that had impacted the region also. Due to COVID-19 pandemic that whole world is facing HPSEB could not arrange to conduct calibration & replacement of energy meters on due date and hence observed a delay of 128 days. Even though calibration validity of the meters is for one year, PP has applied maximum permissible error for the whole months i.e., for the month of Jul 2020, Aug 2020, Sep 2020, Oct 2020 and Nov 2020 conservatively in line with the Validation and Verification Standard.

Detailed calculation is provided in Emission Reduction (ER) calculation excel sheet.

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Document information

Version	*Date*	*Description*
08.0	6 April 2021	Revision to: • Reflect the "Clarification: Regulatory requirements under temporary measures for post-2020 cases" (CDM-EB109-A01-CLAR).
07.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.

Version	*Date*	*Description*
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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