



**Monitoring report form for CDM project activity**  
**(Version 08.0)**

MONITORING REPORT			
<b>Title of the project activity</b>	Hasang Hydro Electric Power Plant		
<b>UNFCCC reference number of the project activity</b>	10632		
<b>Version number of the PDD applicable to this monitoring report</b>	03		
<b>Version number of this monitoring report</b>	01		
<b>Completion date of this monitoring report</b>	14/04/2021		
<b>Monitoring period number</b>	02		
<b>Duration of this monitoring period</b>	01/01/2021-20/03/2021 (both days including)		
<b>Monitoring report number for this monitoring period</b>	01		
<b>Project participants</b>	PT Binsar Natorang Energi		
<b>Host Party</b>	Republic of Indonesia		
<b>Applied methodologies and standardized baselines</b>	Applied Methodology: ACM0002 – Grid-connected electricity generation from renewable resources, version-20.0 Standardized baseline: NA		
<b>Sectoral scopes</b>	01- Energy industries (renewable/ non-renewable sources)		
<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 until 31 December 2020	Amount achieved from 1 January 2021
	0	0	55,710 tCO <sub>2</sub> e
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD</b>	46,820 tCO <sub>2</sub> e		

## SECTION A. Description of project activity

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

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The purpose of the project activity is installation and operation of 39 MW run-of-river hydroelectric project, the generated power is exported to the grid through a Power Purchase Agreement with PT PLN (Indonesian public electricity company). The project activity is a large-scale run-of-river hydropower plant on Aek Kualu river, in the Toba Samosir regency, North Sumatera province, Republic of Indonesia. The project reduces greenhouse gas emissions as the generated electricity.

The project activity comprises three turbines having individually installed capacity 13.73 MW each coupled with three generator units with a net output of 39 MW to meet the Power Purchase Agreement (PPA) signed with PT PLN (Indonesian public electricity company). Hasang Hydro Electric Power Project sustainably produces electricity replacing the fossil fuel plants. All turbines installed under project are Horizontal Francis type turbines with rated output of 13.73 MW capacity. A transmission line is built and tapped to the existing 150kV transmission line between Aek Kanopan and Rantau Prapat.

The project boundary includes the regional electricity grid in Sumatera and all power stations connected to the grid. The start date of the project activity is 24/10/2016 which remarks the signing of equipment and construction contracts. The project activity commissioned in two phases, Unit 1 and 2 were commissioned on 31/12/2019 while unit 3 was commissioned on 10/01/2020.

The project activity is operational with normal operation and maintenance during current monitoring period i.e., 01/01/2021-20/03/2021. The project activity has supplied 62,386.01686 MWh of electricity to the grid during the current monitoring period with emission reduction of 55,710 tCO<sub>2</sub>e.

### A.2. Location of project activity

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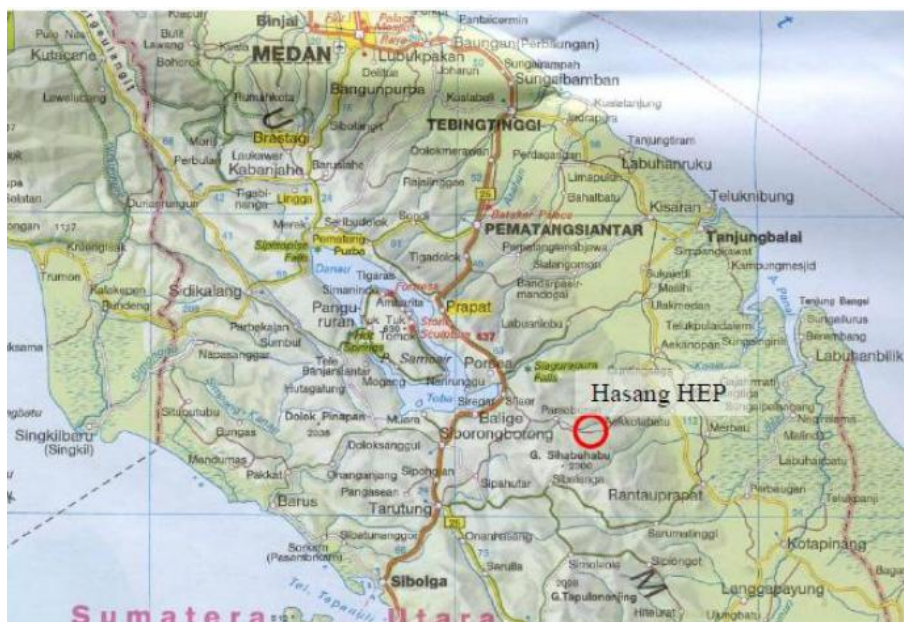


Fig: Project Site

Physical Address:

City/Town/Community: Lumban Rau Utara village, Lumban Rau Tenggara village and Siantarasa village, Nassau District, Toba Samosir Regency.

Region/State/Province: North Sumatera Province

Country: Republic of Indonesia

Geo-Coordinates: 2°17'17.543"N 99°25'53.883"E

### A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Indonesia (host Party)	PT Binsar Natorang Energi (Private entity)	No

### A.4. References to applied methodologies and standardized baselines

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Applied Methodology:

ACM0002: "Grid-connected electricity generation from renewable sources", version 20.0

[EB105\\_repan03\\_ACM0002.pdf \(unfccc.int\)](#)

Tools:

- "TOOL01: Tool for the demonstration and assessment of additionality" V 7.0  
[am-tool-01-v7.0.0.pdf \(unfccc.int\)](#)
- "TOOL02: Combined tool to identify the baseline scenario and demonstrate additionality" V7.0  
[Combined tool to identify the baseline scenario and demonstrate additionality. Version 05.0.0 \(unfccc.int\)](#)
- "TOOL03: Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" V3.0  
[am-tool-03-v3.pdf \(unfccc.int\)](#)
- "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" V 3.0  
[am-tool-05-v3.0.pdf \(unfccc.int\)](#)
- "TOOL07: Tool to calculate the emission factor for an electricity system" V 7.0  
[am-tool-07-v7.0.pdf \(unfccc.int\)](#)
- "TOOL10: Tool to determine the remaining lifetime of equipment" V 1.0  
[Tool to determine the remaining lifetime of equipment \(version 01\) \(unfccc.int\)](#)
- "TOOL11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" V 3.0.1  
[untitled \(unfccc.int\)](#)
- "TOOL32: Positive lists of technologies" V2.0  
[EB105\\_repan05\\_TOOL32 \(unfccc.int\)](#)

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

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The project activity has sought 10 years fixed crediting period starting from 23/12/2020 to 22/12/2030 (both days including).

## SECTION B. Implementation of project activity

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

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The project activity was implemented and operated as per registered PDD. There were no incidents which affected the applicability of the monitoring methodology and monitoring plan. The project activity is a 39 MW run-of-river hydro power plant, which utilizes hydro potential to generate GHG emission free electricity and exports the generated electricity to the Sumatra grid via a Power Purchase Agreement. The start date of the project activity is 24/10/2016 which remarks the signing of equipment and construction contracts. Unit 1 and 2 were commissioned on 31/12/2019 while unit 3 was commissioned on 10/01/2020.

The project is a greenfield hydro power plant. No Dam was constructed instead an overflow weir diverts water to a series of headrace tunnel and headrace channel structures to the power-house where the water rotates the turbines to generate electricity. After that, the stream rejoins the main river at the tailrace.

The Hasang HEPP is connected via a 150kV transmission line (TL) tapping to the 150kV transmission line between Aek Kanopan and Rantau Prapat.

The following are the salient features of the project activity:

Parameter	Value
<b>Intake Weir</b>	
Type	Concrete gravity weir
Normal High-Water Level	559m
Overflow weir net width	53m
Height of the weir	9.5m
Design Flood	25 m <sup>3</sup> /s
<b>Desander</b>	
Dimension	(B) 8.0m x(H) 7.5~8.8m x2Basin
Length	101.75m
<b>Headrace Tunnel</b>	
Dimension	(B) 4.8m x(H) 5.0m
Length	2,667.83m
<b>Headrace Channel</b>	
Type	Open channel / Box converts
Dimension	(B) 4.0m x(H) 3.5m / (B) 4.0m x(H) 3.5~5.5m
Length	1,361.77m
<b>Head Tank</b>	
Type	Concrete
Dimension	(B) 18m x (H) 9.0~16.2m x (L) 43.2m(L)
Flushing gate type	Sliding gate

<b>Penstock</b>	
Type	Circle steel
Diameter	2.7m
Length	1,271m
<b>Powerhouse</b>	
Type	Semi-underground
Turbine type	Francis, horizontal axis 3 units
Net head	189.27
<b>Tailrace</b>	
Type	Concrete channel

The technical specifications of turbine are as follows:

Parameter	Value
Type	Horizontal francis manufactured by Andritz Hydro
Turbine speed	750rpm
Gross head	207.10m
Rated Discharge	8.33m <sup>3</sup> /sec per turbine
Head loss	17.83
Net Head	189.27
Overhead Crane	110t (Main hoist) 20t (Aux hoist)

The technical specification of the generators manufactured by ANDRITZ Hydro are as follows:

Parameter	Value
Number of units	3
Type	Horizontal axis
Voltage	11kV
Installed capacity	13.73 MW
Synchronous speed	750 rpm
Frequency	50Hz
Power factor	0.85

The specifications of the transformer are as follows:

Parameter	Value
Type	Hermetically sealed oil
Number	3
Frequency	50Hz

MVA rating (ONAN/ONAF)	16.8/18.5 MVA
Rated voltage	
High	150kV
Low	11kV

Location of Salient Features:

Feature	GPS (UTM)
Turbine + Generator	47 N 0552694 0253989
Penstock	47 N 0552252 0254386
Power House	47 N 0552694 0253989
Switchyard + Main Transformer	47 N 0552827 0254113
Main Meter / Check meter	47 N 0552843 0254138
Weir / Intake	47 N 0548121 0252872
Transition Channel + Desander	47 N 0548260 0252987
Headpond	47 N 0551775 0254808
Headrace Channel + Tunnel	47 N 0551121 0254717

There was no event or situation occurred during current monitoring period that may had impact the applicability of the monitoring methodology. There was no hindrance in the operation of the project during the current monitoring. The project activity was operation with normal operation and maintenance during current monitoring period i.e., 01/01/2021-20/03/2021.

## **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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There was no deviation from registered monitoring plan and or applied methodology during current monitoring period.

### **B.2.2. Corrections**

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There were no corrections from registered PDD during current monitoring period.

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

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There was no change in the start date of the crediting period.

### **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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There were no changes from registered monitoring plan, applied methodology during current monitoring period.

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

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No change in project design during current monitoring period.

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

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Not applicable.

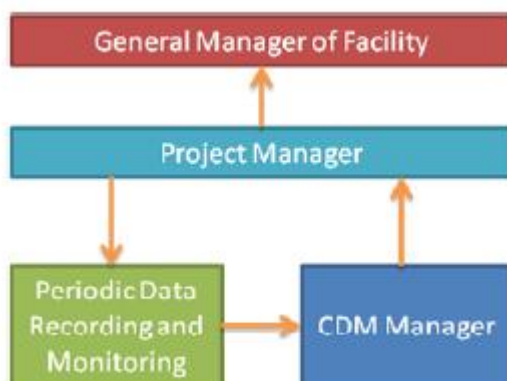
## SECTION C. Description of monitoring system

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All the data collected as a part of monitoring is achieved electronically and will be kept for at least 2 years after the end of last crediting period. All measurements were conducted with calibrated measuring equipment pertaining to relevant industry standard.

### Operation and Management Organization for Monitoring Plan

The CDM manager looks into and manages all the issues related to the CDM project activity. The project manager supervises the CDM manager and is in charge of the project boundary of the facility.



### Installation and Maintenance of Monitoring Equipment

All the monitoring equipment were installed as per national law and guidelines with respect to metering.

### Data Recording and Reporting

The CDM project team is responsible for monitoring of each parameter in timely and correct manner. The team submits the report of all parameters monitored at the end of every month to the project manager.

### Calibration, QA/QC of Monitoring Plan

The monitoring equipment are calibrated periodically and is calibrated as per national law. Manufacturer's specifications and instructions are carefully recorded and followed.

The project manager is responsible for reviewing and checking through the monitoring reports submitted by the CDM Manager. The project manager is responsible for reviewing, recording and archiving calibration reports as well as making sure the calibration is performed in a timely and correct manner as per national law and manufacturer's instructions/specifications.

The General Manager of the whole facility is responsible for reviewing the data and monitoring report every six months.

### Measuring Instrument failure/ Emergency Procedure

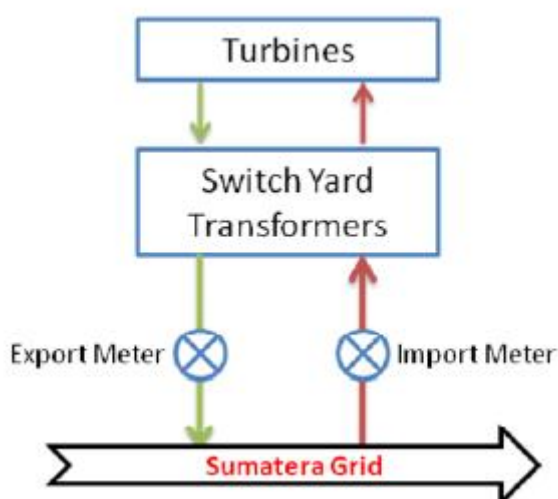
Once a meter in fault, it is replaced immediately. The electricity generated during the period of erroneous measurement and replacement of the faulty meter is not counted towards the emissions reductions. The faulty meter repaired and calibrated by appropriately qualified institutions.

### Monitoring Report

The CDM manager submits a monthly report to the project manager. CDM project manager submit another consolidated report of all activities related to CDM (monitoring, calibration etc) that were performed every six months starting from the crediting start date. This bi-annual report is reviewed

and approved by the Project Manager. A final yearly consolidated report is produced that is reviewed and approved by the General Manager.

### Monitoring Diagram



## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO <sub>2</sub> /MWh
Description	Ex-ante calculation of combined margin CO <sub>2</sub> 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	Direktorat Jenderal Ketenagalistrikan Published data
Value(s) applied	0.893
Choice of data or measurement methods and procedures	The DNA calculated the grid factor according to the Tool to calculate the emission factor for an electricity system
Purpose of data/parameter	To calculate baseline emission
Additional comments	-

Data/Parameter	$Cap_{BL}$
Unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero
Source of data	-
Value(s) applied	0
Choice of data or measurement methods and procedures	Determine the installed capacity based on recognized standards
Purpose of data/parameter	Calculation of power density
Additional comments	-

Data/Parameter	$A_{BL}$
Unit	m <sup>2</sup>



Description	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m <sup>2</sup> ). For new reservoirs, this value is zero
Source of data	Project site
Value(s) applied	0 (No Reservoir)
Choice of data or measurement methods and procedures	Measured from topographical surveys, maps, satellite pictures, etc.
Purpose of data/parameter	Calculation of power density
Additional comments	-

## D.2. Data and parameters monitored

Data/Parameter	<b>EG<sub>facility,y</sub></b>	
Unit	MWh/yr	
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	The main and check meters are placed immediately before the connection to the transmission lines. That is, it is within the switchyard of the Project site.	
Value(s) of monitored parameter	01/01/2021- 20/03/2021: 62,386.01686	
Monitoring equipment	Energy meters	
	Main Meter (Line 1)	Check Meter (Line 1)
	Make: EDM I Type: Mk6E GENIUS Accuracy Class: 0.2s Sr. No: 217308233 Calibration Date: 15/08/2019	Make: EDM I Type: Mk6E GENIUS Accuracy Class: 0.2s Sr. No: 217308234 Calibration Date: 15/08/2019
	Main Meter (Line 2)	Check Meter (Line 2)
	Make: EDM I Type: Mk6E GENIUS Accuracy Class: 0.2s Sr. No: 217308235 Calibration Date: 15/08/2019	Make: EDM I Type: Mk6E GENIUS Accuracy Class: 0.2s Sr. No: 217308236 Calibration Date: 15/08/2019
	Validity of calibration: 2 years	
Measuring/reading/recording frequency	Continuous monitoring, Monthly recording	
Calculation method (if applicable)	Electricity meters were installed as per requirements in the PPA. There are two meters, one that measures the export to the grid and another that measures the import from the grid. The net electricity exported is the difference between these two meters. Data was also cross checked with invoices.	
QA/QC procedures	<p>Meters are calibrated periodically. Inspection was performed by PLN as dictated by the requirements in the PPA.</p> <p>PPA Requirements</p> <ul style="list-style-type: none"> <li>Class 0.2s type metering equipment</li> <li>Calibration and testing to be performed annually from the Commercial Operation Date</li> </ul> <p>In line with the PPA, the project installs Main and check meters. If tests show that the Main meter is inaccurate and the check meter satisfies the applicable accuracy standard, then the measurement of that check meter is used until the main meter is recalibrated.</p>	

Purpose of data/parameter	Calculating $EG_{PJ,y}$
Additional comments	-

<b>Data/Parameter</b>	<b>CAP<sub>PJ</sub></b>
Unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Measured/calculated/default	Calculated
Source of data	Project site
Value(s) of monitored parameter	39,000,000
Monitoring equipment	NA
Measuring/reading/recording frequency	Yearly
Calculation method (if applicable)	Determined in accordance with the nameplates of the turbines and generators of each unit supplied by the manufacturer.
QA/QC procedures	Photographs of the original turbine as well as the turbine name plate capacity taken and verified during the initial validation.
Purpose of data/parameter	Calculating Power Density
Additional comments	-

### 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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Baseline emissions as per methodology is calculated as

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

Where,

$BE_y$  = Baseline emissions in year y (tCO<sub>2</sub>/yr)

$EG_{PJ,y}$  = Quantity of net electricity generation that is produced and fed into the Sumatera grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EF_{grid,CM,y}$  = Combined margin CO<sub>2</sub> 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" (tCO<sub>2</sub>/MWh)

Since Indonesian DNA has defined the combined margin CO<sub>2</sub> emission factor for the Sumatera grid, we used the delineated value of 0.893 tCO<sub>2</sub>/MWh.

As the project activity is a greenfield hydroelectric power project, we use option (a) of the methodology

$$EG_{PJ,y} = EG_{facility,y} = 62,386.01686 \text{ MWh}$$

Where,

$EG_{PJ,y}$  = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EG_{\text{facility},y}$  = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

The net electricity exported to grid are monitored from 01/01/2021 to 20/03/2021 are as below

Month	Net export in MWh (2021)
Jan	27,145.43591
Feb	20,557.27049
Mar	14,683.31046
Apr	--
May	--
Jun	--
July	--
Aug	--
Sep	--
Oct	--
Nov	--
Dec	--
Total	62,386.01686

Baseline Emission from 01/01/2021 to 20/03/2021,

$BE_{y,2020} = 62,386.01686 \text{ MWh} \times 0.893 \text{ tCO}_2\text{e/MWh}$

$BE_{y,2020} = 55,710 \text{ tCO}_2\text{e}$  (round-down value)

Total baseline emission

$BE_y = 55,710 \text{ tCO}_2\text{e}$

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

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Since the project activity is a greenfield renewable energy power generation project activity and has no significant project emissions, the value of the project emission is zero.

$PE_y = 0 \text{ tCO}_2\text{e}$

## E.3. Calculation of leakage emissions

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As per the applied methodology, no leakage emissions are considered. So, Leakage Emission is Zero.

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

	Baseline GHG emissions or baseline net GHG removals (t CO <sub>2</sub> e)	Project GHG emissions or actual net GHG removals (t CO <sub>2</sub> e)	Leakage GHG emissions (t CO <sub>2</sub> e)	GHG emission reductions or net anthropogenic GHG removals (t CO <sub>2</sub> e)			
				Before 01/01/2013	From 01/01/2013 until 31/12/2020	From 01/01/2021	Total amount
<b>Total</b>	55,710	0	0	0	0	55,710	55,710

**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>2</sub> e)	Amount estimated ex ante for this monitoring period in the PDD (t CO <sub>2</sub> e)
55,710	46,820

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

&gt;&gt;

The annual estimated emission reduction as per registered PDD = 216,320  
 Number of days in monitoring period = 79 days  
 Estimated emission reduction for the current monitoring period = (216320\*79)/365  
 = 46,820 tCO<sub>2</sub>e

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

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The electricity generation during current monitoring period is 19.0% higher than ex-ante estimates for same period as per registered PDD. The main reason for increase is mainly due to peak generation season for hydro in host country as not all months of the year get similar water supply, the months under current monitoring period corresponds to peak season.

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

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Not applicable as the project activity is a large-scale project activity

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**Document information**

Version	Date	Description
08.0	6 April 2021	Revision to: <ul style="list-style-type: none"> <li>Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).</li> </ul>

<i>Version</i>	<i>Date</i>	<i>Description</i>
07.0	31 May 2019	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN);</li> <li>• Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period;</li> <li>• Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes;</li> <li>• Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods;</li> <li>• Make editorial improvements.</li> </ul>
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		