



Monitoring report form for CDM project activity
(Version 07.0)

MONITORING REPORT

Title of the project activity	Chutak Hydroelectric Project	
UNFCCC reference number of the project activity	2025	
Version number of the PDD applicable to this monitoring report	12	
Version number of this monitoring report	04	
Completion date of this monitoring report	19/12/2020	
Monitoring period number	01	
Duration of this monitoring period	31/01/2012 to 31/01/2015	
Monitoring report number for this monitoring period	01	
Project participants	NHPC Limited.	
Host Party	India	
Applied methodologies and standardized baselines	ACM0002 ver. 6 - Consolidated methodology for grid-connected electricity generation from renewable sources.	
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
	3304	56,507
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	501,407	

SECTION A. Description of project activity

A.1. General description of project activity

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The project activity involved the construction of a hydroelectric run-of-river plant of 44 MW in India. Four turbines of 11 MW were installed to generate clean and reliable electric power that was sent to the National Grid. As power from the project displaces power generation using fossil fuels elsewhere on the grid, the project activity would lead to a reduction in greenhouse gas emissions. NHPC Limited. (earlier known as National Hydroelectric Power Corporation Ltd.) has developed the project. NHPC is a Government of India Enterprise that was incorporated in 1975. Its objective is to plan, promote and organise an integrated and efficient development of hydroelectric power in all aspects.

The implementation of the project activity will contribute to

1. The replacement of fossil fuel based power generation (from coal and diesel) elsewhere on the grid. This will reduce emissions from fossil fuels combustion.
2. The improvement of basic living conditions (due to availability of electricity) and educational standard (people working on the project will be educated and trained) in such a remote area
3. The economic development of the region.

As a conclusion, the project activity will bring several environmental and socioeconomic benefits thus contributing to the sustainable development of the region.

Relevant dates for the project activity:

Project Promoter	Start Date of Project	Commissioning date
NHPC Limited.	23/09/2006	Unit -1 22/11/2012 Unit -2 08/11/2012 Unit -3 11/11/2012 Unit -4 01/02/2013

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

The total GHG emission reduction achieved during the first monitoring period (31/01/2012 to 31/01/2015) is 59,811 tCO₂e.

A.2. Location of project activity

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Union Territory of Ladakh
Minji Village in Kargil District

Union Territory of Ladakh is the northern extremity of India, and is situated between 32.17 degree and 36.58 degree north latitude and 37.26 degree and 80.30 degree east longitude.

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	NHPC Limited	Yes

A.4. References to applied methodologies and standardized baselines

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ACM0002 ver. 6 - Consolidated methodology for grid-connected electricity generation from renewable sources

"Tool for demonstration and assessment of additionality-version 4"

A.5. Crediting period type and duration

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31/01/2012 to 30/01/2019 (Renewable)

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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Chutak Hydroelectric Project would harness the hydropower potential of river Suru in Kargil district of Union territory of Ladakh. The barrage of the project is located near Sarzhe Village and the powerhouse will be located on the right bank of river Suru near Chutak Village.

For the project activity, the water flow in the rivers was measured at Kargil, at Kochik, near Ashana and at Chelong on Suru and Chelong rivers. The hydrology data available from Central Water Commission¹, Government of India for a period of 22 years from 1978-79 to 1999-2000 was used to carry out the optimization study of the project with the objective of maximizing the average yearly energy production and the firm power during the lean season within economical limits. The average of 10 daily discharge series has been obtained to compute the average annual yield.

The analysis arrived at an optimized capacity of 44 MW with a generation of 216.41 MU (MU = million units = GWh).

While conducting the Environmental Impact Assessment² for the project, University of Jammu and the consultants proposed that minimum quantity of water required for sustenance of aquatic life downstream of the proposed barrage should be released. Accordingly, NHPC considered it necessary to release 1 cumec (m³/s) in the lean season. Based on the release of 1 m³/s of water, the revised energy generation was calculated to be 212.93 MU (GWh).

This figure of 212.93 GWh is the total (gross) power generation by the project and after subtracting the auxiliary consumption and transformer losses, net power exported to the grid comes to 210.38 GWh.

The project envisages utilizing a gross head of 63.4 m to generate 210.38 GWh in a 90% dependable year with an installed capacity of 44 MW. Each of the four 11 MW generating units will operate under a rated head of 52 m and a rated discharge of 24.05 cubic metres per second.

The project has been commissioned fully on 01.02.2013. Technical features of the hydroelectric power station are listed below:

- Barrage: 45.6 m long and 15 m high above crest level.
- Water conductor system consisting of:
- Two intake tunnels of 4.5 m diameter and 295 m length including cut & cover section.
- Head Race Tunnel: Horse Shoe shaped 5.9 m diameter and 4767m long.
- Orifice type Underground Surge Shaft: 19 m diameter and 59 m high.
- Two vertical Pressure Shafts with 3.25m diameter.
- Four horizontal Penstocks of 2.3 m diameter & 31 m long each.
- Underground Powerhouse: 4 Francis Turbines of 11 MW each.
- Tail Race Tunnel: Horse Shoe shaped 5.9m diameter and 55.56m long.
- Switch Yard.

¹ www.cwc.gov.in

² Environmental Impact Assessment report by University of Jammu, dated December 2004

The project is a run-of-river hydro project. The barrage diverts water from the river and involves a flooding of only 0.0481km². Thus the power density is 44 MW per 0.0481km² i.e. very high 915 W/m², compared to dam-based hydroelectric projects.

The turbines are vertical shaft type (Francis type), with an efficiency of 91.25%. The generator is vertical shaft suspended type, salient pole type and directly coupled to a turbine. It is rated for an output of 11 MW at a power factor of 0.90 and rated voltage of 11 KV. The project is connected to the National Grid by the 220 kV Leh-Srinagar transmission line.

The hydroelectric project has a D.G Sets (diesel) for emergency power requirement at the site. The following is the size of D.G. Sets provided at the project: 2x630KVA at Power house (one main and one standby) and 1x500KVA at Barrage.

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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NA

B.2.2. Corrections

>> The following post registration changes have been made

S.No.	Post Registration Change	Type of Change	Reason
1	The latest format of the CDM-PDD-FORM (Version 11.0) is used	General requirement: New PDD template has been used	The latest format of the CDM-PDD-FORM (Version 11.0) is used
2	Additions to the Section A.1	Permanent changes: Additions to description	The relevant dates and Sustainable development component has been added.
3	Changes in the section A.2	Permanent changes: Corrections	The latest map of the location of the project activity has been updated since Ladakh is now a Union Territory.
4	Section A.3: Technologies/measures	Permanent changes: Corrections	The head race tunnel and tail race tunnel lengths have been corrected. The area and the power density have also been changed.
5	Section A.6: History of project activity and Section A.7: Debundling	Permanent changes: Corrections	The sections have been added as per the requirement of the new version of the CDM-PDD-FORM (Version 11.0)
6	Section B.2: Applicability of methodologies and standardised baselines	Permanent changes: Corrections	The table has been added as per the requirement of the new version of the CDM-PDD-FORM (Version 11.0)
7	Change in the name of project location	Permanent changes: Corrections	The name of the project location is changed to Union Territory of Ladakh.
8	Change in the name of project proponent	Permanent changes: Corrections	The name of the project proponent is changed to NHPC Limited.
9	Change in the start date of crediting period	Permanent changes: Corrections	The start date of crediting period is changed to 31/01/2012

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

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The start date of the crediting period is postponed to one year i.e from 01/02/2011 to 31/01/2012.

B.2.4. Inclusion of monitoring plan

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NA

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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NA

B.2.6. Changes to project design

>> The technical details of area and power density are changed. The tail race tunnel and head race tunnel length are also changed.

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

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NA

SECTION C. Description of monitoring system

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The monitoring of baseline emissions implies the application of an operational and management procedure that shall assure the correct and proper measurement and control of all variables involved in the calculation of emission reductions.

The necessary structure is characterised in the table given below.

Operational and management structure

s	Responsibility	Monitoring	Methodology
Chutak Hydroelectric Project	Head of the Project (HOP)	Net Electricity Generation (EGy)	<p>Energy meters are provided to measure Power Generation. These are:</p> <ol style="list-style-type: none"> 1. Main Meter for tariff – provided at line terminal. Accuracy of CT, PT, Energy meter 0.2% 2. Check Meter for tariff - provided at line terminal. Accuracy of CT, PT, Energy meter 0.2% 3. Stand-by meter for tariff – provided on HV side of Generator transformer Accuracy of CT, PT, Energy meter 0.2%. <p>The meters are integrated in nature and as per the latest technology and shall provide the following information stored in nonvolatile memory:</p> <ul style="list-style-type: none"> • Average frequency for each 15-minutes block (integrated for each 0.02 Hz in linear step). • Net active energy (Wh) for each 15-minutes block with sign (+/-). • Cumulative active energy (Wh) at

			<p>each mid-night.</p> <ul style="list-style-type: none"> • Cumulative reactive energy (VARh) each 15-minutes block for low voltage (below 97%) condition. • Meter data storing capacity is 10 days. <p>Meters for energy accounting & audit-provided at HV&LV sides of Unit auxiliary transformer & Station auxiliary transformer. Accuracy of CT, PT, Energy meter 0.2%.</p>
Env. & Diversity Management Division, NHPC Limited.	Dy. General Manager (Env.)	Follow-up of CDM Project	A person in charge was deployed to oversee the project activity.

Monitoring activities that complement the Maintenance Plan:

Monitoring tests like Partial Discharge of generators, Dissolved Gas Analysis of Transformer oil, Insulation Resistance, capacitance, tan delta tests³, and many others are also done to complement the monitoring. Procedures for regular testing and calibration of gauges, panel relays, relays, meters and other instruments are also defined to ensure proper working. The frequency for calibration and other tests are defined as per need following national standards and rules.

Staff Training that complements the Monitoring Plan and Maintenance Plan:

Staff training for proficiency in use of the monitoring instruments is taken care of by the power station management. The HRD cell also conducts training regularly to enhance the skills of personnel attached with such equipment in the operating stations.

The EPC contract includes the supply of the operation and maintenance manuals by the contractor with drawings of the facilities as built. This shall be in such detail as to enable NHPC to operate, maintain, adjust and repair all parts of the facility.

³ Tan Delta testing enables the cable test engineer to detect insulation defects.

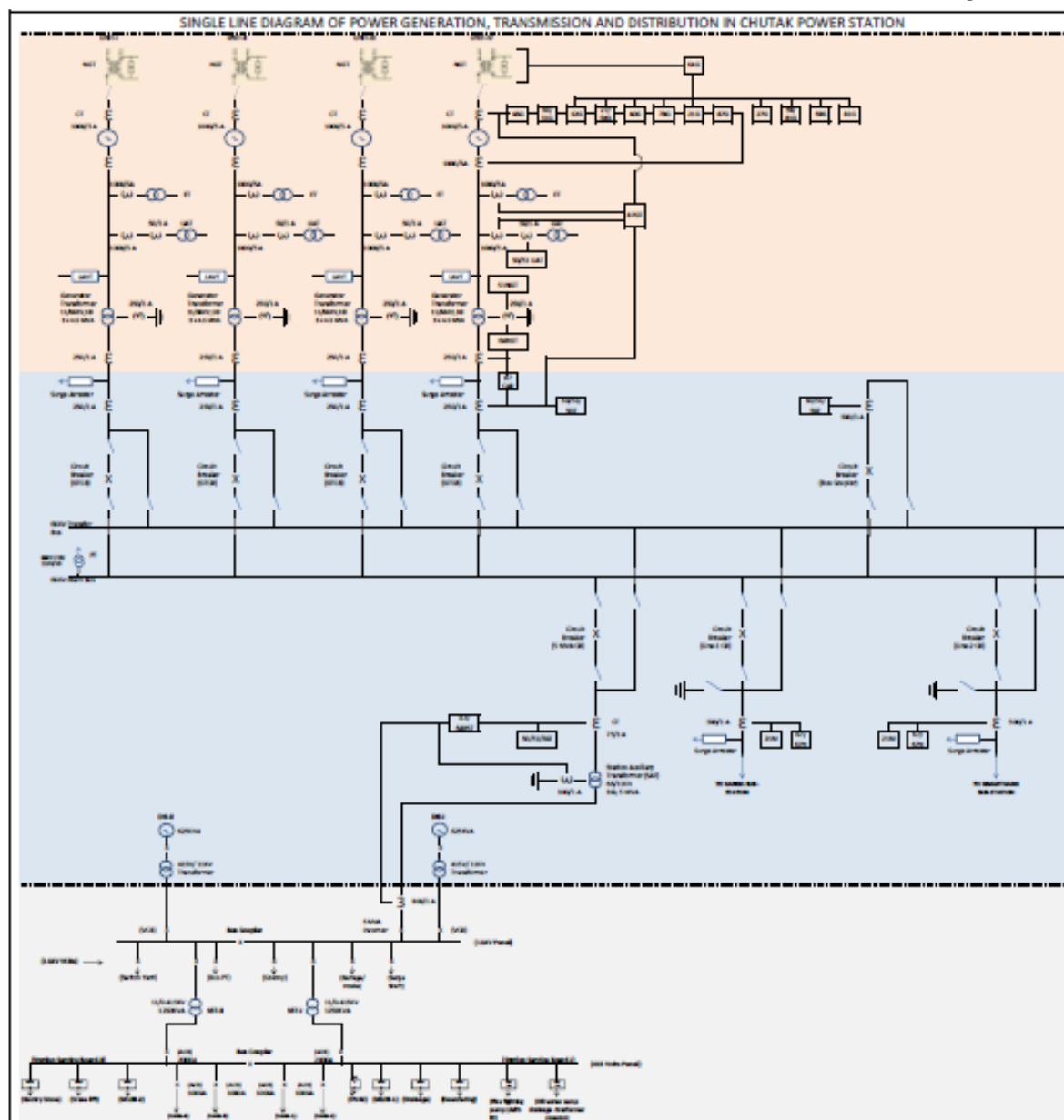


Fig: Single line diagram

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	EF
Unit	tCO ₂ /MWh
Description	Carbon dioxide emission factor of the Northern Region electricity grid
Source of data	Calculated from official data sources (CEA Database) Version 6.0, March 2011 ⁴
Value(s) applied	0.793 for <i>ex-ante</i> estimate of emission reductions
Choice of data or measurement methods and procedures	Calculated according to ACM0002, ver. 6.

⁴ http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver6.pdf

Purpose of data/parameter	To calculate baseline emissions
Additional comments	

D.2. Data and parameters monitored

Data/Parameter	EGy
Unit	MWh
Description	Net electricity generation by the project activity and displaced from the grid.
Measured/calculated/default	Measured
Source of data	Joint Meter reading provided by NHPC
Value(s) of monitored parameter	75424

Monitoring equipment	<p>This value is measured by using energy meters. The monitored values are stored in non-volatile memory. These meters are integrated type with storage of data.</p> <p>For monitoring of the generation and transmission of power, a metering system using digital meters and recorders are provided for generators, for all lines and feeders of Switchyard, Unit transformers, Station Service Transformers, Step Down transformer etc. All parameters such as voltage, current, power, energy, etc., are measured. All the energy meters used for measurements are having an accuracy of 0.2%. All CT's and PT's are provided with a measuring core of accuracy class of 0.2. A system of main meter and check meters both for interface tariff and energy audit was provided.</p> <p>The energy meters are in the custody of the distribution network and the distribution network takes the call based on their requirement. It is noted that no calibration was done during the monitoring period. Therefore, an error factor of 2% is applied to the total net generation.</p>		
		Meter SI number Line 1	Class
	Main Meter	XC522929	0.2
	Check Meter	XC522933	0.2
		Meter SI number Line 2	Class
	Main Meter	XC522927	0.2
	Check Meter	XC522934	0.2
	Generator No.1 Transformer HV Side	Class	
Stand By Meter	KAB11060	0.2	
	Generator No.2 Transformer HV Side	Class	
Stand By Meter	KAB11064	0.2	
	Generator No.3 Transformer HV Side	Class	
Stand By Meter	KAB11059	0.2	
	Generator No.4 Transformer HV Side	Class	
Stand By Meter	KAB11061	0.2	
Measuring/reading/recording frequency	Continuous measurement and Recorded on monthly basis		
Calculation method (if applicable)	Since the metering is done at a number of points, the method of measurement of power generation is free from errors as several points of check and counter check are available.		
QA/QC procedures	The frequency for calibration is followed as per the national standards rules. i.e. once in five years		
Purpose of data/parameter	Baseline emissions and emissions reduction		

Additional comments	The data shall be archived electronically for the entire crediting period + 2 years.
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D.3. Implementation of sampling plan

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NA

SECTION E. Calculation of emission reductions or net anthropogenic removals

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

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Net electricity exported from the project activity = 75,424 MWh

Combined Margin Emission factor for Northern Grid, $EF_{CO_2,grid,y} = 0.793 \text{ tCO}_2\text{e/MWh}$

Formula for baseline emissions (BE_y):

$$BE_y = (EG_y * EF)$$

EG_y = Net electricity produced by the renewable generating unit in the project activity

$$BE_y = (75,424) * 0.793$$

$$= 59,811 \text{ tCO}_2\text{e}$$

$$ER_y = BE_y$$

$$ER_y = 59,811 \text{ tCO}_2\text{e}$$

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

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According to ACM0002 neither project emissions nor leakage effects are to be considered in the emission reductions calculation. Therefore, baseline emissions are equal to emission reductions. . In addition, as the power density is greater than 10 W/m² as demonstrated in the section B.2 of the PDD, there are no emissions associated with it.

E.3. Calculation of leakage emissions

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According to ACM0002 neither project emissions nor leakage effects are to be considered in the emission reductions calculation. Therefore, baseline emissions are equal to emission reductions.

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

	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	59,811	0	0	3304	56507	59,811

Registered PDD monitoring plan stated that the calibration will be done as per the national standards but since the custody of the energy meters is with the distribution network, the distribution network does the calibration according to their requirement. Hence, the calibration was not done during the monitoring period.

As per the validation and verification standard for project activities version 02.0, para 366 (a) if the calibration is delayed, the following conservative approach need to be followed: "Applying the maximum permissible error of the energy meter to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error."

The last calibration was done on 22/10/2020 which reflects error of -0.07% and -0.27% in the Main meters of Line 1 and 2 respectively and -0.06% and -0.26% in the Check meters of line 1 and 2 respectively which are of class of 0.2. As the % error within the limits of Maximum Permissible Error (MPE) +/- 2% thus MPE of -2% has been applied to measured ERs. This has resulted in 59,811 tCO₂e GHG emission reductions or net anthropogenic GHG removals. Thus, the last calibration report and its reference data supports requirement for missing calibration report given in the VVS requirements.

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 ₂ e)	Amount estimated ex ante for this monitoring period in the PDD (t CO ₂ e)
59,811 ⁵	501,407 ⁶

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

>>

PP is claiming emission reduction for 1097 days (31/01/2012 to 31/01/2015). As per the registered PDD 166,831 tCO₂e are the estimated emission reduction for a period of 365 days. Thus for 1,097 days the estimated ex ante emission reduction (as per registered PDD) would be 501,407 tCO₂e.

1	Estimated Emission Reductions per year as per PDD, tCO ₂ e	166,831
2	Start date of the monitoring	31/01/2012
3	End date of the monitoring	31/01/2015
4	Number of monitoring days	1097

⁵ Emission reduction achieved for the period from (31/01/2012 to 31/01/2015)

⁶ As per the registered PDD, the value of estimated emission reduction is 166831 tCO₂e for 365 days. However, the monitoring period is for 1097 days. Thus, the estimated emission reduction for 1097 days is 501407 tCO₂e.

5	Estimated ex ante Emission Reductions per monitoring days	501,407
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E.6. Remarks on increase in achieved emission reductions

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PP is claiming emission reduction for 1097 days (31/01/2012 to 31/01/2015). As per the registered PDD 166,831 tCO₂e are the estimated emission reduction for a period of 365 days. Thus for 1097 days the estimated emission reduction (as per registered PDD) would be 501,407 tCO₂e. There is a decrease of 88.07% in the actual emission reduction as against stated in the registered PDD. Thus, there is no increase in achieved emission reductions.

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

>>NA

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM
Organization:	M/s NHPC Limited
Street/P.O.Box:	Sector -33
Building:	NHPC Office Complex
City:	Faridabad
State/Region:	Haryana
Postfix/ZIP:	121 003
Country:	India
Telephone:	0129-2588110
FAX:	0129- 2277941
E-Mail:	envdivnhpc@gmail.com
URL:	www.nhpcindia.com
Represented by:	-
Title:	Dy. General Manager (Environment)
Salutation:	Mr.
Last Name:	Das
Middle Name:	Kumar
First Name:	Ashis
Department:	Environment & Diversity Management Division
Mobile:	+ 91-9717494567
Direct FAX:	
Direct tel:	+ 91-129-2588667
Personal E-Mail:	envdivmgn-co@nhpc.nic.in

Project participant and/or responsible person/ entity	<input type="checkbox"/> Project participant <input checked="" type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM
Organization name	Core CarbonX Sols Pvt Ltd
Street/P.O. Box	Punjagutta
Building	6-3-668/9, 5R, A-Block, Kanthi Shikhara Complex
City	Hyderabad
State/region	Telangana
Postcode	500082
Country	India
Telephone	+91-40-64102137
Fax	+91-40-23410367
E-mail	info@corecarbonx.com
Website	www.corecarbonx.com
Contact person	
Title	Managing Director
Salutation	Mr.
Last name	Mohanty
Middle name	Kumar
First name	Niroj
Department	
Mobile	+91-9908387772
Direct fax	+91-40-23410367
Direct tel.	+91-40-64102137
Personal e-mail	nmohanty@corecarbonx.com

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
07.0	31 May 2019	Revision to: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.

<i>Version</i>	<i>Date</i>	<i>Description</i>
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		