Project design document form for small-scale CDM project activities

(Version 05.0)

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for small-scale CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	Bundled Charmadi Mini Hydel and Aniyur Hole Small Hydro Project at Karnataka, India.
Version number of the PDD	02.1
Completion date of the PDD	12/12/2014
Project participant(s)	International Power Corporation Private Limited
Host Party	India
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	Sectoral Scope: Energy industries (renewable / non-renewable sources) Selected Methodology : AMS ID – Grid Connected Renewable Electricity Generation
Estimated amount of annual average GHG emission reductions	26,553 tCO_{2e}

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>

Brief Description of Project Activity

The bundled project activity is implementation of 10.5 MW hydro power project in the Karnataka state of India. The purpose of the bundled project is to generate Hydro-electric power utilising naturally available potential energy in the water fall of Aniyur river in Dakshin Kannad District & water flows of Charmadi stream (tributary to the Nethravathi River) Dakshin Kannada district in Karnataka State, India. The project supplies electricity to Karnataka Power Transmission Corporation Limited (KPTCL) which falls under the Southern grid system of India.

The bundled project includes Aniyur Hole Small Hydro Project (AHSHP) (6 MW) and Charmadi Mini Hydel Scheme (CMHS) (4.5 MW) both of which were proposed by International Power Corporation Private Limited (IPCPL).

Both the projects AHSHP & CMHS were being managed under the name of Prasanna Power Limited (PPL) and Thrinethra Energy Conversions Limited (TECL) respectively until the time these companies were amalgamated (merged) into IPCPL on 04th April 2014. Through this amalgamation order, all the debts, assets, business licenses, permits, authorizations, approvals etc are transferred over to IPCPL.

Both PPL and TECL were Special Purpose Vehicles (SPV) for the managing the proposed projects and were 100% subsidiary of IPCPL.

IPCPL is a Indian company with currently 3 operating project activities one of which has been operation and registered with CDM from 25th May 2006 (UNFCCC Ref No: 0312). The other 2 projects are included under this bundle CDM project activity.

AHSHP contemplates utilization of natural fall of the Aniyur river. The project is estimated to generate annual gross energy generation of 17.5 GWh. Net energy would be 16.97 GWh in a year The Scheme utilizes seasonal monsoon discharges of the river mainly from southwest monsoon. The power generated will be stepped up to 11/33 KV level at the switchyard of the generating station for further evacuation of the same to the nearest switching station at Kakkinge.

CHMS is a small run of the river hydro project across Charmadi stream (tributary to the Nethravathi River) in Dakshin Kannada district of Karnataka.The estimated annual gross energy generation is 12.5 GWh. Net energy would be 12.43 GWh in a year. The power generated will be stepped up to 11/33 KV level at the switchyard of the generating station for further evacuation of the same to the nearest switching station at Kakkinge.

Pre-project Scenario & Baseline

There was no activity at the site prior to implementation of the project activity. Hence the scenario existing prior to the project activity is same as baseline scenario which is continual use of highly carbon intensive electricity in the regional grid.

How the proposed activity reduces GHG emissions

The proposed project activity generates electricity using hydro potential and converts it into mechanical energy using hydro turbines, which drives the alternators to generate energy. The generated electricity is exported to the regional grid system, which is Southern region grid. Hence, the generation by the proposed activity is non-GHG source and thus reduces the proportion of fossil fuel based generation in the grid leading to lesser carbon intensive grid.

The baseline scenario in the absence of project activity continues to be highly carbon intensive and emission reductions generated by the project activity are additional. The project activity neither results in any direct emissions of GHGs nor in any leakage outside the project boundary.

The annual GHG emission reduction through this project activity is 26,553 tCO2e and total GHG emission reduction for the chosen 7 year crediting period will be 185,871 tCO2e.

The project activity involves setting up 10.5 MW Hydro Power Project for generation of electricity through a renewable source. The falls under "Type I: Renewable energy project activities with a maximum output capacity of 15 MW (or an appropriate equivalent)" under sectoral scope 1, Energy industries (renewable /non-renewable sources).

Project Contribution to Sustainable development:

Ministry of Environment and Forests, Govt. of India has stipulated the following indicators for sustainable development[1] in the interim approval guidelines for CDM project.

a) Social well-being
b) Economic well-being
c) Environmental well-being
d) Technological well-being

These project activity contributions towards the sustainable development are as follows;

Economic well-being:

- The project activity would help in alleviation of poverty in the area as it creates employment opportunities to the local people.
- The project activity would bring in additional investment to the region which would have not been possible in the absence of project activity. The development of project activity would contribute significantly towards infrastructure development of the region which ultimately leads to rural area development.
- The project activity evacuating power to the nearest regional grid would lead to improvement of electricity availability as the electricity is fed into a deficit grid.

Social well-being:

- The project activity would improve the local infrastructure development.
- Power generated from this project activity can be used for small scale industries, thus would generate employment opportunities.

Environmental well-being:

- Hydro is one of the cleanest form of renewable energy and power generation does not involve any fossil fuels.
- The project activity by replacing electricity generated from fossil fuels would result in reduction of both GHG emissions and air borne pollutants, such as oxides of nitrogen, oxides of sulphur, carbon monoxide and particulates.
- Produces electricity without any GHG emissions.

Technological well-being:

- The project would use the environmental safe and sound technologies in small scale hydroelectric power sector.
- It will improve the power quality and the improvement of transmission and distribution congestion.
- The successful implementation and operation of the project would serve as demonstration for harnessing hydro potential and encourage setting up of similar projects in future.

[1] http://envfor.nic.in/divisions/ccd/cdm_iac.html

All the above are the contribution of the project activity for the sustainable development.

A.2. Location of project activity

A.2.1. Host Party

>>
India

A.2.2. Region/State/Province etc.

>>
State: Karnataka

A.2.3. City/Town/Community etc.

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Project	Village	Taluk	District
Aniyur Hole Small Hydro Project	Aniyur	Belthangadi	Dakshin Kannada
Charmadi Mini Hydel Scheme	Kakkanje	Belthangadi	Dakshin Kannada

A.2.4. Physical/Geographical location

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Aniyur SHP is located in Dakshin Kannad District contemplates utilization of natural fall of the Aniyur river. Aniyur SHP is located at a distance of 22 Km from Dharmasthala.

Charmadi Mini Hydel Scheme contemplates utilization of flows and head available in the Charmadi stream (tributary to the Nethravathi River) for power generation. It is located about 2km from Mangalore Kottigehar Road near Charmadi Village.

Project site is a distance of about 370 km from Bangalore. Nearest Rail head can be reachable at a distance of 50 Km at Puthur.

The physical location of plant site is depicted in the maps below:

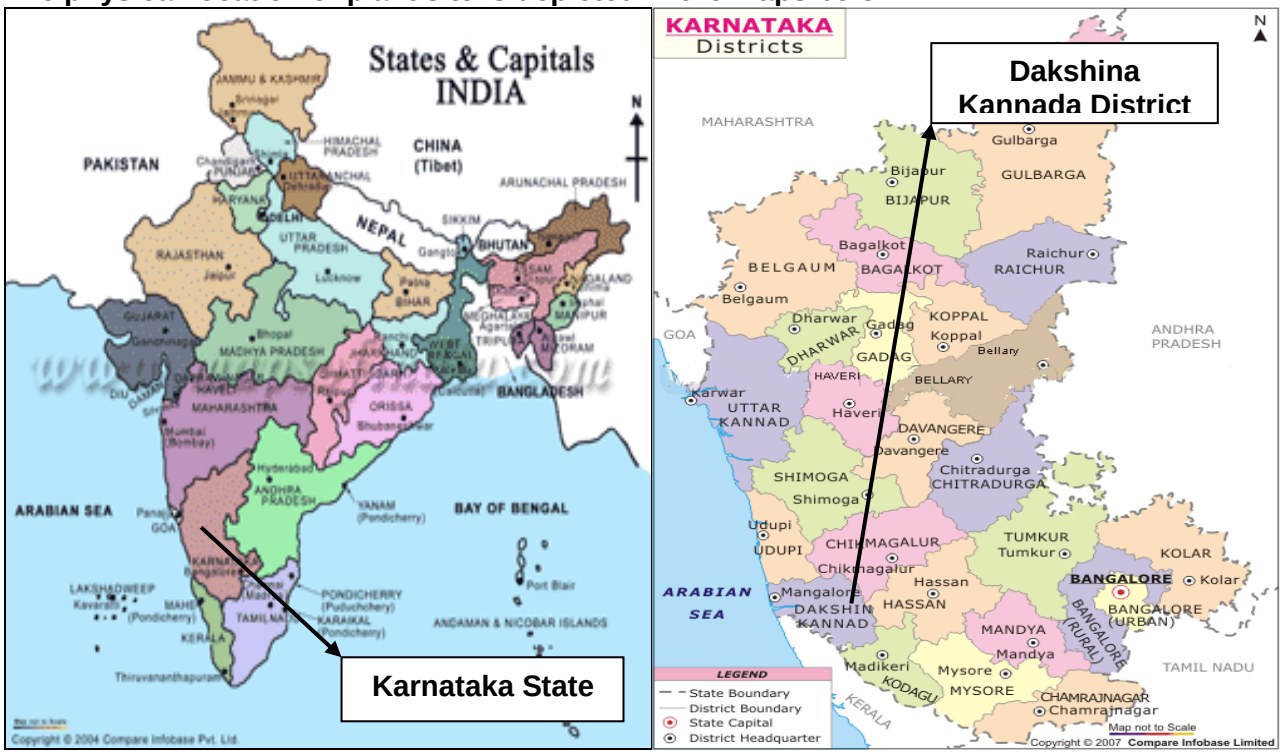

Fig 1: Location of Karnataka State in India Map[2] **Fig 2:** Location of Dakshina Kannada District in Karnataka State Map[3]

Geographical coordinates of Power House of AHSHP is Latitude- 13.07826 N and Longitude- 75.43911 E.

Geographical coordinates of power House of CMHS project activity is Latitude- 13.03581 N, and Longitude- 75.38811 E.

A.3. Technologies and/or measures

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Technical details of Aniyur Hole Small Hydro Project (AHSHP) (6 MW)

The technology employed for power generation in a hydroelectric plant is, converting the potential energy available in the water into mechanical energy using hydro turbines and then into electrical energy using alternators. The components involved in the Aniyur Hole SHEP are Pick up wear, intake structure, Trash racks, Intake gates, Surge Tank, Penstock, Power House and Tail race. The estimated annual power generation is 17.5 GWh. The generated power will be transformed to match the nearest 33 kV substation near Kakkinge.

S. No	Parameters	Specifications
Generator		
1	Make	WEG
2	No of Generating Units	02
3	Capacity of Each Generating Units	3000kW
4	Total Capacity of this project activity	6000 kW
5	Type of generator	3 phase, Synchronous Generator
6	Excitation System	Brushless
7	Power Factor	0.85
8	Rated Frequency	50HZ
9	Rated Speed	600RPM
10	Generation Voltage	11kV
11	Efficiency of Generator at 100% rated output	96.7%
Penstock		
12	No of Penstock	1
13	Length of Penstock	850 m
14	Internal Dia	2.40m
15	Shell thickness	14 mm
16	Type	Steel Penstock
Turbine		
17	Make	Kirloskar Brothers Ltd
18	Type of Turbine	Horizontal Francies
19	No of Turbines	2
20	Turbine Speed	600 RPM
21	Continuous Over Load Capacity or Rated Output	3142 kW
22	Efficiency at rated output	92.7%

[2] http://www.mapsofindia.com/maps/india/india-political-map.htm

[3] http://www.mapsofindia.com/maps/karnataka/karnataka.htm

23	Continuous Over Load Capacity	110%
24	Rated Net Head in (m)	48.0 m
25	Rated discharge at rated head in (cumecs)	7.21 cumecs
Forebay		
26	FSL	EL 195.60 m
27	MDDL	EL 199.20 m
28	Forebay Floor Level	EL 195.60 m
29	Top of Side Walls	EL 199.20 m
30	Size	40.0m (L) * 2.5 m (B)
Power House		
31	Type	Surface/Pit type
32	Size	40.80* 21.40 m
33	Installed Capacity	6.0 MW
34	No of Bays	2unit bays and one service bay
35	Generator Floor Level	143.50m
36	Switch Gear room floor level	150.50m
37	Control Room Floor Level	150.50m
38	Gross Head	54.60 m
39	Net Head	48.00 m
Transmission Lines 110kV		
40	Length	12.1 KM to Kakkinje Pooling Station point of Energy Recording.
41	Terminal Point	Kakkinje pooling station, KPTCL 33 kV substation
42	Type	33 kV Single Circuit
Water Conductor System		
43	Type	Circular Steel Pipe
44	Nos	1
45	Size	4.91Sq Mtrs
46	Length	725 m
47	Wall Thickness	14 m
Tail Race Channel		
48	Type	Open Channel
49	Size	11.0m Wide x 25m long
Monitoring Equipment		
50	Monitoring Equipment (Electricity meter) type	Trivector Energy Meter
51	Electricity meter accuracy class	0.2s.
52	Location of Electricity meter	At the pooling station which is 12.1 km from the plant site

Technical Specification of Charmadi Mini Hydel Scheme (CMHS) (4.5 MW)

The components involved in the Charmadi Mini Hydel Scheme are pick up weir, open channel/Penstock, Surge Tank, Power House and Tail race channel . The estimated annual generation is 12.5 GWh. Electricity will be generated at a lower voltage, which will be stepped up to higher voltage level within the project boundary to facilitate export of power to KPTCL.

S. No	Parameters	Specifications
Generator		
1	Make	WEG

2	No of Generating Units	02
3	Capacity of Each Generating Units	2250 kW
4	Total Capacity of this project activity	4500 kW
5	Type of generator	3 phase, Synchronous Generator
6	Excitation System	Brushless
7	Power Factor	0.85
8	Rated Frequency	50HZ
9	Rated Speed	500 RPM
10	Generation Voltage	11kV
11	Efficiency of Generator at 100% rated output	95.0%
Penstock		
12	No of Penstock	1
13	Length of Penstock	800 m
14	Internal Dia	2.10 m
15	Shell thickness	14 mm
16	Type	Steel Penstock
Turbine		
17	Make	HPP Energy (India) Pvt Ltd
18	Type of Turbine	Horizontal Francies
19	No of Turbines	2
20	Turbine Speed	500 RPM
21	Efficiency at rated output	85%
22	Continuous Over Load Capacity or Rated Output	2250 kW + 10% Overload
23	Rated Net Head in (m)	39 m
24	Rated discharge at rated head in (cumecs)	7.75 cumecs
Forebay		
25	FSL	EL 186.0 m
26	MDDL	EL 188.00 m
27	Forebay Floor Level	EL 190.0 m
28	Top of Side Walls	EL 190.0 m
29	Size	35.00 m (L) * 2.50 m (B)
Power House		
30	Type	Surface/Pit type
31	Size	36.0 * 18.00 m
32	Installed Capacity	4.5 MW
33	No of Bays	2 unit bays and one service bay
34	Generator Floor Level	140.0m
35	Switch Gear room floor level	150.0m
36	Control Room Floor Level	150.0m
37	Gross Head	42.0 m
38	Net Head	39.0 m
Transmission Lines 110kV		
39	Length	7.00 KM to Kakkinje Pooling Station point of Energy Recording.
40	Terminal Point	Kakkanje Pooling Station, KPTCL 33 kV substation
41	Type	110 kV Single Circuit
Water Conductor System		
42	Type	Circular Steel Pipe
43	Nos	1

44	Size	3.46Sq mtrs
45	Length	800 m
46	Wall Thickness	0.014 m
Tail Race Channel		
47	Type	Open Channel
48	Size	18m Wide x 25m long
Monitoring Equipment		
49	Monitoring Equipment (Electricity meter) type	Trivector Energy Meter
50	Electricity meter accuracy class	0.2s.
51	Location of Electricity meter	At the pooling station which is 7.0 km from the plant site

Technology transfer

No technology transfer from other countries in involved in the project. The project activity uses technology that is locally available in the country. The project activity is Greenfield project activity and there was no activity at the site prior to the implementation of the project activity and hence, no information on age and average lifetime of the equipment based on manufacturer's specifications and industry standards, and existing and forecast installed capacities, load factors and efficiencies is provided.

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	Private Entity: International Power Corporation Private Limited[4]	No

A.5. Public funding of project activity

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The project activity does not involve any public funding from Annex I countries.

A.6. Debundling for project activity

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As per debundling guidelines specified in Appendix C to the 'Simplified Modalities and Procedures for Small Scale CDM project activities', a proposed small scale project activity shall be deemed to be a debundled component of a large scale project activity if there is a registered small scale project activity or an application to register another small scale project activity under the CDM

- in the same project category and technology / measure;
- with the same project participants;
- within the previous 2 years; and
- whose boundary is within 1 km of the project boundary of the proposed small scale activity at the closest point.

[4] It is to be noted that in the webhosted PDD, PPL (Prasanna Power Limited) was considered as the Project participant of the bundled project activity. However, due to amalgamation of PPL in IPCPL (parent company of PPL), now IPCPL has been updated as the project participant. A copy of the High Court order has been provided to the DOE for reference of unconditional merger of PPL & TECL (both 100% subsidiaries of IPCPL) into IPCPL.

The project activity is thus not a debundled component of a larger project activity, since there is no registered or no request for registration of CDM project activity in the same project category and technology/measure by the same project participants within 1km of the present activity in last two years.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

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Project Type : Type I – Renewable Energy Projects
Category I D : AMS I.D (grid connected renewable electricity generation), Version 17, EB 61
Reference : AMS I.D, Version 17, EB 61 (Valid from 17/06/2011)[5]

AMS I-D draws into following tool to determine baseline for electricity system

"Tool to calculate emission factor for an electricity system",
Reference: Version 04.0, EB – 75, Annex- 15.

B.2. Project activity eligibility

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The applicability conditions of the approved small scale methodology AMS I-D version 17, as relevant for the project activity has been described below:

<table>
<tr><th>AMS-I.D. Applicability Conditions</th><th>Project Applicability</th></tr>
<tr><td>This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal, and renewable biomass:
(a) Supplying electricity to a national or a regional grid.
(b) Supplying electricity to an identified consumer facility via national / regional grid through a contractual agreement such as wheeling.</td><td>The project activity generates power through renewable hydro resources and the generated power is supplied MESCOM which makes a part of Southern grid.

Thus, meets the applicability condition.</td></tr>
<tr><td>Illustration of situations under which the methodology applies as given in the table below:

<table>
<tr><th></th><th>Project type</th><th>AMS-I.A</th><th>AMS-I.D</th><th>AMS-I.F</th></tr>
<tr><td>1</td><td>Project supplies electricity to a national/regional grid</td><td></td><td>√</td><td></td></tr>
<tr><td>2</td><td>Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)</td><td></td><td></td><td>√</td></tr>
<tr><td>3</td><td>Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)</td><td></td><td>√</td><td></td></tr>
<tr><td>4</td><td>Project supplies electricity to a mini grid[17] system where in the baseline all generators use exclusively fuel oil and/or diesel fuel</td><td></td><td></td><td>√</td></tr>
<tr><td>5</td><td>Project supplies electricity to household users (included in the project boundary) located in off grid areas</td><td>√</td><td></td><td></td></tr>
</table>
</td><td>The power generated by the project activity will be supplied to Karnataka Power Transmission Corporation Limited (KPTCL) which falls under the southern grid system of India. . This confirms to point (1) & (3) of the table.

Thus, meets the applicability condition.</td></tr>
</table>

[5] http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X

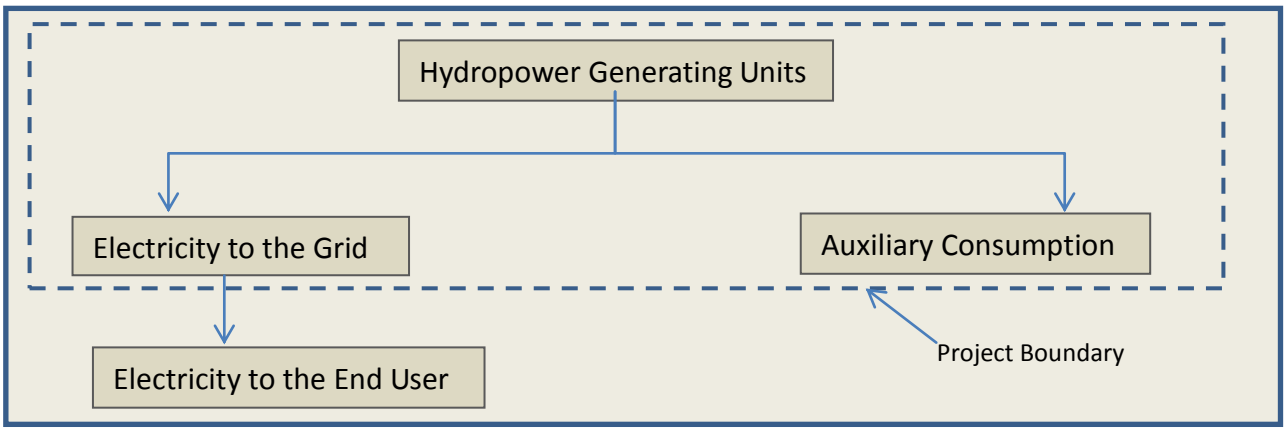
This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of an existing plants	The project activity is a Greenfield plant i.e. installation of a new grid hydro power plant. **Thus, meets the applicability condition.**
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: ✓ *The project activity is implemented in an existing reservoir with no change in the volume of reservoir;* ✓ *The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2;* ✓ *The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2.*	This project activity is a grid connected hydro power project which comprises run of river hydroelectric scheme and there is no reservoirs in this project activity. **Thus, the condition is not applicable.**
If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.	There is no non-renewable component or fossil fuel co-firing system involved in the project activity. **Thus, the condition is not applicable.**
Combined heat and power (co-generation) systems are not eligible under this category.	The project activity involves only power generation system and no heat generation is involved. **Thus, meets the applicability condition.**
In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	This project activity is a Greenfield hydro power plant and does not involve addition of capacity in any existing renewable energy generation unit. **Thus, the condition is not applicable.**
In the case of retrofit or replacement, to qualify as a small scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW	The project activity is a newly grid connected hydro power project. There is no retrofit or replacement of any existing project. **Thus, the condition is not applicable.**

The project activity meets all applicability criteria of the methodology AMS I.D. Ver 17, EB 61 and the application of the methodology is thus justified.

B.3. Project boundary

In accordance with AMS I.D, the project boundary encompasses the physical, geographical site of the renewable generation source.

The project boundary is the physical boundary around the catchment areas, weirs, desilting tank, headrace tunnels, fore bay, penstock, powerhouse, tailrace and the transmission system till the evacuation point. The electricity would be exported to the Karnataka Power Transmission Corporation Limited (KPTCL) grid. Hence for the purpose of baseline calculations, Southern regional grid of India is also included in the project boundary.



B.4. Establishment and description of baseline scenario

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The project activity involves electricity generation through hydro power plant and sale of the electricity to the Southern grid. In the absence of the project activity equivalent amount of electricity would have been generated by the operation of fossil fuel based power plants connected to Southern grid. The Project activity thus reduces the anthropogenic emissions of greenhouse gases (GHGs) in to the atmosphere associated with the equivalent amount of electricity generation from the fossil fuel based power plants connected to Southern grid.

AMS ID, clause no 10 recommends baseline as electricity delivered to grid

The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

Hence only alternative is no project scenario or the same amount of electricity supplied by the project shall be supplied by grid connected power plants

As per the clause 12 of approved methodology AMS I.D, Version 17, EB 61 the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO2e/kWh) calculated in a transparent and conservative manner as:

a) Combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in "Tool to calculate the emission factor for an electricity system" (EB 75, Annex 15, Version 04.0).

OR

b) The Weighted average emissions (in kg CO_2e/kWh) of the current generation mix.

The project proponent has opted for approach 'a' i.e. combined margin emission factor and desired to fix the emission factor ex-ante and keep it constant throughout the crediting period for the sake

of adopting more simple approach for calculation of emission reductions.

The key parameters used to determine the baseline emissions are furnished below:

Table B.1. Key Parameters for Baseline emission factor

Key Parameter	Value	Data Source	Website
EF	Baseline emission factor for the southern region grid	CEA published baseline emission factor for southern region grid (CM) Ex-ante fixed	**"**CO2 Baseline Database Version.08 January 2013" published by CEA[6]

The baseline emission factor has been considered from the "**CO2 Baseline Database Version .08 January 2013**" published by CEA. The emission factor published by CEA for the latest year 2011-12 is 900 tCO2/GWh for the southern grid based on combined margin approach. The Emission factors have been calculated according to the guidelines of CDM UNFCCC website.

B.5. Demonstration of additionality

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Serious consideration of CDM:

As per the EB Guidelines 62, Annex 13 on the Demonstration and Assessment of Prior Consideration of the CDM[7] which states, *Proposed project activities with a start date before 2 August 2008, for which the start date is prior to the date of publication of the PDD for global stakeholder consultation, are required to demonstrate that the CDM was seriously considered in the decision to implement the project activity. Such demonstration requires the following elements to be satisfied:*

(a) The project participant must indicate awareness of the CDM prior to the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project. Evidence to support this would include, inter alia, minutes and/or notes related to the consideration of the decision by the Board of Directors, or equivalent, of the project participant, to undertake the project as a CDM project activity.

(b) The project participant must indicate, by means of reliable evidence, that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation. Evidence to support this should include one or more of the following: contracts with consultants for CDM/PDD/methodology services, draft versions of PDDs and underlying documents such as letters of authorization, and if available, letters of intent, emission reduction purchase agreement (ERPA) term sheets, ERPAs or other documentation related to the potential sale of CERs (including correspondence with multilateral financial institutions or carbon funds), evidence of agreements or negotiations with a DOE for validation services, submission of a new methodology or requests for clarification or revision of existing methodologies to the CDM Executive Board, publications in newspaper, interviews with DNAs, earlier correspondence on the project with the DNA or the UNFCCC secretariat.

As described under section A.2 of this document, M/s International Power Corporation Private Limited, (IPCPL) through AHSHP & CMHS, started hydro projects with the objective of making a viable investment with the help of CDM. IPCPL has already registered another hydro power CDM project (UNFCCC Ref: 0312, 25th May 2006) and hence was complete aware of the benefits under CDM.

[6] http://cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm (Version 08 dated January 2013)

[7] http://cdm.unfccc.int/UserManagement/FileStorage/PU2ARNBM3KFXS9HZ6OELGTICJ81VYD

The start date of the proposed project activity is on 08.11.2006 which is before 2nd August 2008. In line with the guidelines Annex 13 of EB 62, Para no 06 requires project activities for which the start date is prior to the date of publication of the PDD for global stakeholder's consultation, to demonstrate that serious consideration of CDM in the decision to implement the project activity. Such demonstration, as per the Annex requires the following elements to be satisfied with documentary evidence, viz.,

- Awareness of the CDM prior to the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project; and
- That continuing and real action was taken to secure CDM status for the project in parallel with its implementation.

The project proponent had been well aware of the CDM benefits prior to the start date of the project activity as they had already been through the process for one of their previous project activity which was already registered with UNFCCC. The first requirement stipulated by EB is also satisfied by the resolution passed by the board of directors of the project activity. A copy of the resolution of the Board of Directors is submitted to the DOE for verification. The resolution was passed by the board of directors prior to the commencement of project activity start date. The contents of the resolution would reveal clearly that CDM benefit was a decisive factor in the decision to proceed with the project.

The second element relates to the demonstration by means of reliable evidence, that continuing an real action were taken to secure CDM status for the project in parallel with its implementation. Evidence to support this, as per annex 13, EB 62 includes contracts with consultant for CDM services, appointment of DOE, among others. The detailed chronology of events of the project activity is furnished below.

Chronology of Events

Chronology Of Events	AHSHP	CMHS
Board decision for entering PPA and to implement the project considering CDM	**06.09.2006**	**03.08.2006**
Loan Sanction by SBI & PNB	06.11.2006	29.08.2006
Placement of the Work Order for Civil Work	08.11.2006	16.11.2006
Signing of PPA with BESCOM	12.12.2006	12.12.2006
Loan Sanction by SBM	24.01.2007	--x
Notices and Publication about Local Stakeholder'	15.07.2007	
Local Stake holder's meeting	**30.07.2007**	
Email communication for Sale proposal of CERs	30.07.2007	
Appointment of the CDM consultant	**26.12.2008**	
Email Communication Negotiating Price of CER	11.06.2009	11.06.2009
Commissioning of the Project	13.08.2009	05.07.2008
Appointment of Validator	**29.07.2010**	
Webhosting of the project on UNFCCC website	**24.09.2010**	
Host Country Approval	**21.02.2012**	
Final Validation Report (Negative) issued by SGS	30.01.2013	
Appointment of new Consultant	**15.03.2013**	
Appointment of another DOE	15.05.2013	
Webhosting of the PDD	09.07.2013	
Site Visit by the DOE & PP	**14.08.2013**	

Barrier Analysis

Referring to **"Guidelines on the demonstration of additionality of small scale project activities",** *EB 68, Annex 27 guidelines*, project participants are required to provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barrier:

(a) ***Investment barrier****: a financially more viable alternative to the project activity would have led to higher emissions;*
(b) ***Technological barrier****: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions*
(c) ***Barrier due to prevailing practice:*** *prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions*
(d) ***Other barriers:*** *without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.*

The additionality for this bundled project activity is established with "***Investment Barrier***" which may affect the successful implementation and operation of the project activity.

Investment Barrier:
The economic or financial attractiveness of the project activity is demonstrated using *Investment Barrier*. This is done by comparing the financial returns of the project activity to that of a suitable benchmark and if the returns of the project activity are less than the benchmark, it is deemed that the project is **additional**. For the purpose of the same, the description on selection of the additionality approach, the financial indicator and the benchmark is given in table below.

Project additionality parameters:

	Parameter Selected	Compliance to Guidelines	Description
Additionality Approach	*Benchmark Approach*	Guidelines on the Assessment of Investment Analysis [8], Version 05, EB 62, Annex 5.	**Guidance 19:** which states *"If the alternative to the project activity is the supply of electricity from a grid then the benchmark approach is considered appropriate"*.
Benchmark	*Prime Lending Rate (PLR)*	Guidelines on the Assessment of Investment Analysis, Version 05, EB 62, Annex 5.	**Guidance 12:** which states *"In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity are appropriate benchmarks for equity IRR"*. The present project activity being funded by *debt: equity*, hence the

[8] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

			returns from the investment in the project activity have been estimated using ***Project IRR***. In line with the above guidelines, the PP has considered PLR as the appropriate benchmark for comparison against *Project IRR*.

The present project activity being a bundled project activity, the investment decision date of Aniyur Hole Small Hydro Project *(AHSHP)* and Charmadi Mini Hydel Scheme *(CMHS)* are on 06/09/2006 and 03/08/2006 respectively. The IRR estimated is specific to their project activities and hence further compared with the benchmark. The estimation of benchmark value, IRR and sensitivity analysis is given below.

1. Estimation of Benchmark:

The benchmark approach is considered appropriate since *the alternate to the project activity is the supply of electricity from a grid*. For the purpose of benchmark analysis, prime lending rate is used as the benchmark to compare with the pre-tax IRR of the project activity.

For this Project activity project IRR is used as financial indicator since the capital structure of the project involves both equity and debt, correspondingly Prime Lending Rate as declared by Reserve Bank of India has been considered as benchmark.

The benchmark selected represents the cost of funds and therefore the minimum rate of return which the project should earn to merit consideration of investment in the project.

The below table shows the applicable BPLR applicable at the time of decision making:

S. No	Project Proponent	BPLR Range	Benchmark	Reference
1	Aniyur Hole Small Hydro Project (AHSHP)	11.00% – 11.50%	11.25%	http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/72594.pdf
2	Charmadi Mini Hydel Scheme (CMHS)	10.75% – 11.25%	11.00%	http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/71884.pdf

2. Appropriateness of benchmark:

The pre-tax IRR for the Project activity has been computed by taking into account the cash outflows (capital investment in the project, cash inflows comprising profit before tax and salvage value (in the terminal year). Internal Rate of Return (IRR) of the project is compared with the Prime Lending Rate. As per the Para 13 of the Investment guideline, "In the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on Parameters that are standard in the market". Prime Lending Rate is a publically available data as well as a standard parameter to determine lending rates in Indian economy hence selection of Prime Lending Rate as benchmark is appropriate.

3. Estimation of Project IRR:

The IRR analysis is carried out to substantiate the *Investment Barrier.* Following are the key data used for the calculation of Project IRR:

ANIYUR HOLE SMALL HYDRO PROJECT (AHSHP):

Particulars	Value	Units	Ref Details

No. of generating units	2	Nos.	DPR page No 46
Capacity of each generating unit	3000	kW	DPR page No 46
Total generating Capacity	6000	kW	Calculated Value
Plant Load Factor	33.30%	%	DPR page No 11
Auxiliary power consumption	1.00%	%	DPR page No 67
Transmission Lossess	2.00%	%	DPR page No 67
Technical			
MNRE Subsidy	220.00	Rs. Lakh	MNRE Guidelines
Tariff Rate	2.80	Rs./ kWh	DPR page No 11
O & M Expenses	.50%	% of project Cost	DPR page No 67
Insurance	0.50%	% of project Cost	DPR page No 67
Annual Escalation	5.00%	%	DPR page No 67
Working Capital Requirement			
Interest on Working Capital	12.50%	%	DPR page No 67
O & M	1	Month	DPR page No 67
Receivables Equivalent to 2 months of energy charges for sale of electricity	2	Month	DPR page No 67
Working Capital Loan	75%	%	DPR page No 67
Working Capital Margin	25%	%	DPR page No 67
Financial			
Total project cost	3500.00	Rs. Lakh	DPR page No 21
Cost per MW	583.33	Rs. Lakh	Calculated Value
Debt	50%	%	DPR page No 11
Equity	50%	%	DPR page No 11
Interest Rate on Term Loan	11.50%	%	DPR page No 66
Repayment Period	9	Year	DPR page No 66
Moratorium	1	Year	DPR page No 66
Taxation			
Tax Rate	33.99%	%	As applicable in 2006-07
MAT	7.50%	%	As applicable in 2006-07
Book Depreciation Rate			
Building & Civil works	3.4%	%	DPR page No 66
Plant & Machinery	5.28%	%	DPR page No 66
IT Depreciation Rate			
Building & Civil works	10.00%	%	As per IT Rules 2006-07
Plant & Machinery	15.00%	%	As per IT Rules 2006-07
CERs			
Gross Energy generated	175.00	Lakh Units	DPR page No 17
Net generation after deducting losses	169.79	Lakh Units	Calculated Value

CHARMADI MINI HYDEL SCHEME (CMHS):

Particulars	Value	UoM	Ref Details
Energy Generation			
No. of generating units	2	Nos.	DPR page No 13
Capacity of each generating unit	2250	kW	DPR page No 13
Total generating Capacity	4500	kW	Calculated Value
Plant Load Factor	31.71%	%	Calculated Value
Auxiliary power consumption	0.50%	%	DPR page No 30
Technical			
MNRE Subsidy	190.00	Rs. Lakh	-
Tariff Rate	2.80	Rs./ kWh	DPR page No 13
O & M Expenses	1.00%	% of project Cost	DPR page No 30
Insurance	0.50%	% of project Cost	DPR page No 30
Annual Escalation	5.00%	%	DPR page No 30
Working Capital Requirement			

Interest on Working Capital	12.50%	%	DPR page No 30
Receivables Equivalent to 2 months of energy charges for sale of electricity	2	Month	DPR page No 30
Working Capital Loan	75%	%	DPR page No 30
Working Capital Margin	25%	%	DPR page No 30
Financial			
Total project cost	2550.00	Rs. Lakh	DPR page No 29
Cost per MW	566.67	Rs. Lakh	Calculated Value
Debt	60%	%	DPR page No 29
Equity	40%	%	DPR page No 29
Interest Rate on Term Loan	11.50%	%	DPR page No 29
Repayment Period	8	Year	DPR page No 30
Moratorium	1	Year	DPR page No 30
Taxation			
Tax Rate	33.99%	%	As applicable in 2006-07
MAT	7.5%	%	As applicable in 2006-07
WDV Depreciation Rate			
Building & civil works	3.4%	%	DPR page No 61
Plant & Machinery	5.28%	%	DPR page No 61
IT Depreciation Rate			
Building & civil works	10.0%	%	As per IT Rules 2006-07
Plant & Machinery	15.00%	%	As per IT Rules 2006-07
CERs			
Gross Energy generated	125.00	Lakh Units	DPR page No 61
Net generation after deducting losses	124.38	Lakh Units	Calculated Value

The input values used in the investment analysis are valid and applicable as per the investment decision making by the project participant. This is in-line with the *"Guidelines on the Assessment of Investment Analysis, paragraph 6, Annex 05, EB 62"*.

Considering the above mentioned assumptions and working out the project profitability, the Project IRR for AHSHP and CMHS works out to **7.87%** and **7.45%** as against the benchmark value of **11.25 & 11.00%** respectively. Hence it is clearly evident that the project is not a business as usual scenario and this needs additional revenue stream to make to strengthen the project returns.

4. Result of Financial Assessment

Sl. No	Project Proponent	Benchmark (%)	IRR (%)
01	Aniyur Hole Small Hydro Project	11.25%	7.87%
02	Charmadi Mini Hydel Scheme	11.00%	7.45%

5. Sensitivity Analysis:

The purpose of the sensitivity analysis is to examine whether the conclusion regarding the financial viability of the project activity is sound and tenable with those reasonable variation in the assumptions.

Sensitivity Analysis	
Guidance	**Reasoning**
Guidance 20: Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations	*In line with the guidance, the following variables are subjected to the variation in the sensitivity analysis carried out –* • *Plant Load Factor (PLF)* • *Project Cost*

of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets.	• *Operation & Maintenance Cost* • *Tariff Rate*
Guidance 21: As a general point of departure variations in the sensitivity analysis should at least cover a range of +10% and -10%, unless this is not deemed appropriate in the context of the specific project circumstances.	*In line with the guidance, a range of +10% to -10% was considered for all the above variables in the sensitivity analysis.*

The financial performance of the project activity is found to be sensitive to the following factors –
1. Project cost
2. Plant Load Factor
3. Cost of O&M
4. Tariff

For AHSHP:

1. **Project cost:**

The project cost as envisaged by AHSHP is INR. 3500 Lakh. A variation to the scale of 10% is unrealistic as the actual project cost realized by the project proponent (INR 4178 Lakh)) has also been provided to DOE. Hence any variation over it is not required.

Breaching Benchmark: This is only possible when the project cost is put to variation of 21.05% or in other words bringing the project cost down to INR. 2763.95 Lakh. Such variation in project cost is unlikely. Moreover, the project has been commissioned hence any change in project cost is not possible.

Change in Project cost	-10%	10%	-21.03%
Project IRR	9.28%	6.72%	Benchmark Breach

2. **Plant Load Factor (PLF):**

This is the most critical of all factors that can have a major impact on the financial performance of the project activity. However, PLF is based on many factors which project proponent has no control on and it carries a lot of uncertainty. The PLF for the project activity works out to be 33.30% and is referred from the Loan application letter submitted to Banks for Loan Sanction. This value was derived from the recommend values in the Detailed Project Report. Moreover, it can be verified from the past operational data that average PLF from the time of project commissioning works out to be ~22.5% which is significantly lower than what was estimated.

A change of even +10% in PLF however is not able to make the project financially attractive.

Breaching Benchmark: A gross PLF of 41.82% would be required to shoot up the IRR to such high. It is unrealistic for the PLF to suddenly raise to such an extent as the past generation data speaks otherwise. Further, it is to be noted that the even the KERC order dated 18.01.2005, recommends a PLF of 30% as standard.

Change in energy generation	-10%	10%	25.60%
Project IRR	6.38%	9.27%	Benchmark Breach

3. **Tariff Rate:**

As per the PPA with KPTCL the project tariff is fixed for 10 years at Rs. 2.80/ kWh without any escalation. Any change in the tariff is unlikely for a period of 10 years. Further as the project is already commissioned it can also be verified that the same PPA is applicable.

It is to be noted that the client has considered the same tariff for the lifetime of the project activity. This is supported by the fact that tariff after the 10 year period is can be recalculated based on operative expenses which works out to be lesser than the tariff itself. Hence, most of the Hydro projects having PPA with KPTCL which complete its binding period either continue in the same tariff or and does not opt for recalculation of the tariff.

Inline with the guidelines, a sensitivity of 10% has been applied to the tariff as tabulated below. However, it is to be noted that the in practice any variation should be applied to tariff only after completion of the binding period (10 years).

Breaching Benchmark: A variation of 25.60% on the tariff is required to breach benchmark. However, in other scenario where a variation should be applied for tariff after 10 years, it would be a variation of 144.87% (or INR 6.86/kWh) that is required to breach benchmark. Such huge increase in tariff is evidently unrealistic.

Change in Tariff Rate	-10%	10%	25.56%
Project IRR	6.38%	9.27%	Benchmark Breach

It can be seen that even at a sensitivity of +10% on tariff, the IRR is still below benchmark.

4. **Cost of O&M:**

The cost of O&M maintenance for the project lifetime is also one of the factors constituting more than 20% of the project cost. Hence this parameter also subjected to a variation of ±10%.

Breaching Benchmark: It is clear that the project does not cross benchmark at a variation of 10%. Even in the case of 100% variation in the O&M cost does not breach benchmark. Hence, even if this value is “zero” the IRR does not cross benchmark.

Change in O&M Cost	-10%	10%	NA
Project IRR	8.03%	7.71%	Benchmark Breach

As evident, Project IRR is below the benchmark even in most favourable conditions. The project IRR reaches benchmark only through unrealistic variation to the parameters of project cost, PLF and tariff. Further the IRR does not reach the benchmark even if the O & M cost is reduced by 100%. All the four scenarios are not possible.

For CMHS:

1. **Project cost:**

The project cost as envisaged by CMSH is INR. 2550 Lakh. A variation to the scale of 10% is unrealistic as the actual project cost realized by the project proponent (INR 3124 Lakh) has also been provided to DOE. Hence any variation over it is not required.

Breaching Benchmark: This is only possible when the project cost is put to variation of 22.47% or in other words bringing the project cost down to INR. 1977.02 Lakh. Such variation in project cost is unlikely. Moreover, the project has been commissioned hence any change in project cost is not possible.

Change in Project cost	-10%	10%	22.47%

Project IRR	8.82%	6.34%	Benchmark Breach

2. **Plant Load Factor (PLF):**

This is the most critical of all factors that can have a major impact on the financial performance of the project activity. However, PLF is based on many factors which project proponent has no control on and it carries a lot of uncertainty. The PLF for the project activity works out to be 31.71% as per the Loan application letter submitted to Banks for Loan Sanction. This value was derived from the recommend values in the Detailed Project Report. Moreover, it can be verified from the past operational data that average PLF from the time of project commissioning works out to be ~19% which is significantly lower than what was estimated.

A change of even +10% in PLF however is not able to make the project financially attractive.

Breaching Benchmark: A PLF of 40.40% would be required to shoot up the IRR to such high. It is unrealistic for the PLF to suddenly rise to such an extent as the past generation data speaks otherwise. Further, it is to be noted that the even the KERC order dated 18.01.2005, recommends a PLF of 30% as standard.

Change in energy generation	-10%	10%	27.41%
Project IRR	6.05%	8.82%	Benchmark Breach

3. **Tariff Rate:**

As per the PPA with KPTCL the project tariff is fixed for 10 years at Rs. 2.80/ kWh without any escalation. Any change in the tariff is unlikely for a period of 10 years. Further as the project is already commissioned it can also be verified that the same PPA is applicable.

It is to be noted that the client has considered the same tariff for the lifetime of the project activity. This is supported by the fact that tariff after the 10 year period is can be recalculated based on operative expenses which works out to be lesser than the tariff itself. Hence, most of the Hydro projects having PPA with KPTCL which complete its binding period either continue in the same tariff or and does not opt for recalculation of the tariff. .

In-line with the guidelines, a sensitivity of 10% has been applied to the tariff as tabulated below. However, it is to be noted that the in practice any variation should be applied to tariff only after completion of the binding period (10 years).

Breaching Benchmark: A variation of 27.41% on the tariff is required to breach benchmark. However, in other scenario where a variation should be applied for tariff after 10 years, it would be a variation of 154.71% (or INR 7.13/kWh) that is required to breach benchmark. Such huge increase in tariff is evidently unrealistic.

Change in Tariff Rate	-10%	10%	27.41%
Project IRR	6.05%	8.82%	Benchmark Breach

It can be seen that even at a sensitivity of +10% on tariff, the IRR is still below benchmark.

4. **Cost of O&M:**

The cost of O&M maintenance for the project lifetime is also one of the factors constituting more than 20% of the project cost. Hence this parameter also subjected to a variation of ±10%.

Breaching Benchmark: It is clear that the project does not cross benchmark at a sensitivity of 10%. Even in the case of 100% variation in the O&M cost does not breach benchmark. Hence, even if this value is “zero” the IRR does not cross benchmark.

Change in O&M Cost	-10%	10%	NA
Project IRR	7.60%	7.30%	Benchmark Breach

As evident, Project IRR is below the benchmark even in most favourable conditions. The project IRR reaches benchmark only through unrealistic variation to the parameters of project cost, PLF and tariff. Further the IRR does not reach the benchmark even if the O & M cost is reduced by 100%. All the four scenarios are not possible.

All the scenarios discussed above indicate that CDM revenue is an important part of the project activity to make it financially viable and also it to the only factor which makes the IRR reach the benchmark.

In the above background, the PP of the bundled project activity submits that the project is unlikely to achieve the benchmark even under favorable conditions and hence justifies the need of CDM funds to help in improving the project competitiveness and financial sustainability.

Conclusion:
The implementation of the project activity would result in anthropogenic GHG emission reductions. However, the PP is dependent on the projected revenues to be accrued from the sale of carbon credits as it would provide the necessary cover to overcome or alleviate the risks or the barriers faced. Registering the project activity as a CDM project, would provide additional revenue to the project activity improving the project’s profitability and economic viability. Thus in accordance with the above barrier analysis, the project activity is deemed to be **additional**.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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The project activity uses renewable energy source to generate electricity and exports the generated electricity to the grid system (KPTCL), which constitutes of both fossil fuels and non-fossil fuels sources of electricity generation. Emission reductions due to the project activity are considered to be equivalent to the baseline emissions, since the hydroelectricity project would not lead to any project emission and leakage emissions. Emission reductions are related to the electricity exported by the project and the emission coefficient of the grid system. However, parameters are included if any diesel is used for backup power in future.

Baseline

The baseline emissions are calculated based on the net energy provided to the grid (in GWh/year), and an emission factor for the displaced grid electricity (in tCO2 /GWh). The baseline scenario is electricity delivered to the grid by the project that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.

$$BE_y = EG_{BL,y} \times EF_{CO2,grid,y} \quad (1)$$

where,

$EG_{BL, y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y ($EG_{BL,y}$ is calculated by addition on of **$EG_{facility1, y}$ + $EG_{facility2,y}$**.)[9]

EF_y = CO_2 emission factor of the grid in year y (t CO_2/MWh)

Formula used to calculate the net emission reduction for the project activity is

$$ER_y = BE_y – PE_y – LE_y$$

Where,

ER_y	-	Emission Reduction in tCO2/year
BE_y	-	Baseline emission in tCO2/year
PE_y	-	Project emissions in tCO2/year
LE_y	-	Emissions due to leakage in tCO2/year

Project Emission:

No project emissions are applicable to the proposed small scale hydroelectric power project, since the electricity generation is based on hydro resources, which does not involve any combustion or generation of emissions from fossil fuels.

As per paragraph 20 of approved methodology AMS-I.D. (Version-17, EB- 61), for most renewable energy project activities, PE_y= 0. This project activity is a grid connected hydro power generation. Hence there is no project emission from the project activity.

However, as the project is equipped with diesel generator of suitable capacity to meet the emergency requirements of power house etc., emissions out of usage of fossil fuel (diesel) will be accounted for as project emissions. In case, if diesel generator is utilized to supply the emergency requirement for the project activity, diesel consumption shall be monitored in plant log records. Emissions resulting from usage of diesel in the backup diesel generator will be accounted as project emissions based on the following equation as provided in the “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” version 2.

CO_2 emissions from fossil fuel combustion in process is calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$\mathbf{PE_{FC, j, y} = \sum FC_{i, j, y} \times COEF_{i, y}}$$

Where:

$PE_{FC, j, y}$ = Are the CO_2 emissions from diesel combustion in process j during the year y (tCO_2/yr);

$FC_{i, j, y}$ = Is the quantity of diesel combusted in process j during the year y (mass or volume unit/yr);

$COEF_{i, y}$ = Is the CO_2 emission coefficient of diesel in year y (tCO_2/mass or volume unit)

i = Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i, y}$ can be calculated using one of the two Options described in the tool. From which we have chosen option B:

Option B: The CO_2 emission coefficient $COEF_{i, y}$ is calculated based on net calorific value and CO_2 emission factor of the diesel, as follows:

[9] PP has considered AHSHP is facility 1 and CMHS is Facility 2.

$COEF_{i, y}$ = $NCV_{diesel, y}$ x $EF_{CO_2, diesel, y}$

Where:
$COEF_{i, y}$ = CO_2 emission coefficient of diesel in year y (tCO_2/mass or volume unit)
$NCV_{diesel, y}$ = weighted average net calorific value of the diesel in year y (GJ/mass or volume unit)
$EF_{CO2, diesel, y}$ = weighted average CO_2 emission factor of diesel in year y (tCO_2/GJ)

Hence, the project emissions for the proposed project activity can be calculated as follows:

$PE_{diesel, j, y} = FC_{diesel, j, y}$ x $NCV_{diesel, y}$ x $EF_{CO_2, diesel, y}$

Where,
$FC_{diesel, j, y}$ = quantity of diesel used during the year
$NCV_{diesel, y}$ = weighted average net calorific value of diesel in year y
$EFco_{2, diesel, y}$ = weighted average CO_2 emission factor of fuel type diesel in year y

In case the parameter for quantity of diesel used during year y "$FC_{diesel, j, y}$" has been measured in volume, it will be converted to mass of diesel:

$FC_{diesel, j, y} = F_{d,y}$ * Density

Where:

$F_{d,y}$ is the quantity of diesel used during the year (Ltrs)

Density of diesel (0.82 kg/Ltr. as per Society of Indian Automobile Mfgs.http://www.siamindia.com/scripts/Diesel.aspx)

Leakage Emission:
As per paragraph 22 of the approved methodology AMS-I.D. (Version-17, EB- 61), *if the energy generating equipment is transferred from another activity, leakage is to be considered*.

This project activity is a grid connected hydro power generation. As there is no energy generating equipment is transferred from another activity to this project activity. Hence there is no leakage emission from the project activity.

LE_y = 0 tCO_2/year

Baseline emission factor (*EF_{CO2}*)
A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the *"Tool to calculate the emission factor for an electricity system"* based on that baseline emission factor has been calculated Ex-ante based. The following steps are used to calculate the baseline emission factor:

Step 1: Identify the relevant electricity systems.
The tool[10] defines the electric power system as the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints. Keeping this into consideration, the Central Electricity Authority (CEA)[11], Government of India has divided the Indian Power Sector into two regional grids.

[10] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

[11] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

The project activity is located in the state of Karnataka which comes under Southern grid in India and the electricity generated by this project displaces the electricity from Southern grid. Due to the displacement of electricity the project activity would have an impact on the Southern grid. Thus all the power generation facilities connected to this grid form the boundary for the purpose of baseline estimation. Since the project supplies electricity to the Southern grid, emissions generated due to the electricity generated by the Southern grid as per CM calculations will serve as the baseline for this project.

Step 2: Choose whether to include off-grid power plants in the project electricity systems (Optional)

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

***Option I:** Only grid power plants are included in the calculation.*

***Option II:** Both grid power plants and off-grid power plants are included in the calculation.*

Option I corresponds to the procedure contained in earlier versions of this tool. Option II allows the inclusion of off-grid power generation in the grid emission factor. Option II aims to reflect that in some countries off-grid power generation is significant and can partially be displaced by CDM project activities, e.g. if off-grid power plants are operated due to an unreliable and unstable electricity grid. Option II requires collecting data on off-grid power generation as per Annex 2 and can only be used if the conditions outlined therein are met. Option II may be chosen only for the operating margin emission.

The Project Participants choose the grid connected power plants (Option I) to calculate the operating margin and build margin Emission Factor.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,\ OM,\ y}$) is based on one of the following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM

Any of the four methods can be used. However, the simple OM method (option a) can be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

Years	2007-08	2008-09	2009-10	2010-11	2011-12
Southern Grid[12]	27.1 %	22.8 %	20.6 %	21.0%	21.0%
Average	22.5 %				

The above table clearly shows that the percentage of total grid generation by low-cost/must-run plants (on the basis of average of five most recent years) for the Southern grid is only 22.5 % which is much lesser than 50% of the total generation. Thus, Simple OM method can be used for calculating the emission factor.

For the simple OM, the emissions factor can be calculated using either of the two following data vintages:

• *Ex ante* option: For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.

[12] http://cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Or

• *Ex post* option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

The project proponent chosen an ex ante option for calculation of the OM with a three year generation weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.

Step 4: Calculate the Operating Margin emission factor according to the selected method.
The simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} * NCV_{i,y} * EF_{co2,i,y}}{\sum_{M} EG_{m,y}}$$

Where:

$EF_{grid, OM simple, y}$	= Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i, m, y}$	= Amount of fossil fuel type i consumed by power plant/unit m in year y (mass or volume unit)
$NCV_{i, y}$	= Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2, i, y}$	= CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m, y}$	= Net electricity generated and delivered to the grid by power plant/ unit m in year y (MWh)
m	= All power plants/units serving the grid in year except low cost must run power plants/units
i	= All fossil fuel types combusted in power plant/unit m in year y
y	= either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation.

Year	2009-10	2010-11	2011-12	Average
Operating Margin [13] (tCO2/MWh)	0.94150	0.94188	0.95978	**0.9482**

Step 5: Calculate the build margin (BM) emission factor
Project participants can choose between one of the following two options:

Option 1
For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2
For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to

[13] http://cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 as described above is chosen in the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PDD and is fixed for the first crediting period. The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EGm,y * EF_{EL,m,y}}{\sum_m EGm,y}$$

Where:

$EF_{grid, BM, y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh).
$EG_{m, y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh).
$EF_{EL, m, y}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m	=	Power units included in the build margin.
y	=	Most recent historical year for which power generation data is available.

Year	2011-12
Build Margin[14] (tCO2/MWh)	**0.8521**

Step 6: Calculate the combined margin emissions factor

The calculation of the combined margin (CM) emission factor ($EF_{grid, CM, y}$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

The option (a) i.e. Weighted Average CM *given above is chosen in the project activity and the combined margin emissions factor is calculated as follows:*

$EF_{grid,CM,y}$	=	$EF_{grid,OM,y}$	*	w_{OM}	+	$EF_{grid,BM,y}$	*	w_{BM}
	=	0.9482	*	0.50	+	0.8521	*	0.50
	=	**0.9001 tCO_2/MWh**						

Where:

$EF_{grid, BM, y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid, OM, y}$	=	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}	=	Weighting of operating margin emissions factor (%)[15]
w_{BM}	=	Weighting of build margin emissions factor (%)

Emission Reductions:

Since the project emissions as well as the leakage are zero, the emission reductions are equal to the baseline emissions. These are calculated based on the monitored net amount of electricity supplied to the grid, and the baseline emission factor.

$ER_y = BE_y - PE_y - L_y$

[14] http://cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

[15] For hydro power projects: w_{OM} = 0.50 and w_{BM} = 0.50 is used as a default values.

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$NCV_{diesel,y}$
Unit	*TJ/Gg*
Description	Net calorific value of diesel
Source of data	IPCC Default value (*"2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Tables 1.4 and 2.2"*) IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value(s) applied	41.4
Choice of data or Measurement methods and procedures	IPCC value has been used for the fuel type since no country specific oxidation factor is available. In case of any revision in the IPCC guidelines, the revised value shall be taken into account.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	$EFco_{2\ diesel,\ y}$
Unit	t CO_2/TJ
Description	Weighted average CO_2 emission factor of the diesel consumed in the project activity 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 Chapter1 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	IPCC values have been used for emission factor of diesel because no country specific data is available. In case of any revision in the IPCC guidelines, the revised value shall be taken into account.
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	EF_y
Unit	t CO2/GWh
Description	CO_2 emission factor for the regional grid system
Source of data	CEA published grid emission factors
Value(s) applied	900.1 Average of 3 year OM (2009 to 2012) and latest year of BM (2011-12)
Choice of data or Measurement methods and procedures	With a view to obtaining uniformity of approach in the country towards a common objective, Central Electricity Authority (CEA) values have been used, which are authentic and are made available publicly by Govt of India.
Purpose of data	The data is used to calculate emission reductions.
Additional comment	The Combined Margin Emission Factor has been calculated as a weighted sum of Operating Margin emission factor and Build Margin emission factor taking the weight age value as 0.50 and 0.50 respectively

B.6.3. Ex ante calculation of emission reductions

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Baseline emissions

Baseline emissions calculated as explained in section B.6.1 above are summarised as below.

PP has considered AHSHP is facility 1 and CMHS is Facility 2.

Baseline Emissions:

$$\mathbf{EG}_{\text{facility1, y}} = \mathbf{EG}_{\text{facility1, export y}} - \mathbf{EG}_{\text{facility1, import y}}$$

$$\mathbf{EG}_{\text{facility2, y}} = \mathbf{EG}_{\text{facility2, export y}} - \mathbf{EG}_{\text{facility2, import y}}$$

$$\mathbf{EG}_{\text{BL, y}} = \mathbf{EG}_{\text{facility1, y}} + \mathbf{EG}_{\text{facility2, y}}$$

$$= 17{,}064 + 12{,}437$$

BE_y = 29,501 GWh * 900.1 tCO_2/GWh

BE_y = 26,553 tCO_2

Project emissions

The project emissions due to the combustion of diesel are considered as zero for estimating ex-ante emission reductions. The quantity of diesel consumed for operating DG set during emergency situations is expected to be negligible. However the quantity of diesel combusted in the project activity will be monitored during each year of crediting period and project emissions will be deducted from baseline emissions. Provisions have been provided in Section B.6.1 for calculating project emissions. Since the quantity of diesel that will be consumed is unpredictable before actual operation of the project, and also to simplify the ex-ante calculations of emission reductions, excluding project emissions is considered reasonable.

$PE_y = 0$

Leakage emissions

This project activity is a grid connected hydro power generation. As there is no energy generating equipment is transferred from another activity to this project activity. Hence there is no leakage emission from the project activity.

$LE_y = 0$

Emission reductions

$ER_y = BE_y - PE_y - L_y$

$ER_y = 26,553 - 0 - 0$

$ER_y = 26,553$ tCO2 ($ER_y = BE_y$)

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2015	26,553	0	0	26,553
2016	26,553	0	0	26,553
2017	26,553	0	0	26,553
2018	26,553	0	0	26,553
2019	26,553	0	0	26,553
2020	26,553	0	0	26,553
2021	26,553	0	0	26,553
Total	**185,871**	**0**	**0**	**185,871**
Total number of crediting years	07[16]			
Annual average over the crediting period	**26,553**	**0**	**0**	**26,553**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

(Copy this table for each piece of data and parameter.)
AHSHP is facility 1 and CMHS is Facility 2.

[16] PP has Chosen renewal Crediting period for the Project Activity.

Data / Parameter	$EG_{facility1, export\ y}$
Unit	MWh
Description	Quantity of electricity supplied by the project plant/unit to the grid in year *y*
Source of data	From the Joint Meter Reading (JMR)
Value(s) applied	17,064 MWh (This is estimated but actual electricity generation is based on realistic scenario)
Measurement methods and procedures	For measuring the export and import of energy by the project activity at the interconnection point, one set of tri-vector meter (main meter and check meter) is provided. The meter reading is recorded at the beginning of every month in the presence of both the PP representative and MESCOM representative and is called as joint meter reading. The monthly statements are prepared based on the same and is used for billing purpose. The meter is a two way meter in which both import and export is recorded. Hence the meter can also provide a net electricity supplied value. Monitoring Frequency**:** Continuously Measurement Frequency: Hourly Recording Frequency**:** Monthly from Energy Meter, Summarized Annually Calibration Frequency**:** Once in a year Archiving Policy**:** Paper & / Electronic
Monitoring frequency	**Measurement methods and procedures:** *Data Typed**:*** Calculated using export and import data from energy meter reading. *Monitoring equipment for import and export data**:*** Trivector Energy Meter. *Monitoring frequency:* continuously *Recording frequency:* monthly and aggregated annually *Archiving Policy**:*** Paper & Electronic
QA/QC procedures	The metering equipment is maintained in accordance with electricity standards and is of accuracy class 0.2. Every month these readings are recorded in the presence of plant personnel and KPTCL, which are archived for cross-checking. These meter readings are used to determine the electricity supplied to the grid by the project activity. The meters are in the custody of KPTCL and are calibrated every year. Records of meter reading are maintained at Project site.
Purpose of data	Calculation of baseline emission.
Additional comment	

Data / Parameter	$EG_{facility1, importy}$
Unit	MWh
Description	Quantity of electricity imported by the project plant/unit from the grid in year *y*
Source of data	From the Joint Meter Reading
Value(s) applied	0
Measurement methods and procedures	For measuring the export and import of energy by the project activity at the interconnection point, one set of tri-vector meter (main meter and check meter) is provided. The meter reading are recorded at the beginning of every month in the presence of both the PP representative and MESCOM representative and is called as joint meter reading. The monthly statements are prepared based on the same and is used for billing purpose. The meter is a two way meter in which both import and export are recorded. Hence the meter can also provide a net electricity supplied value. Monitoring Frequency**:** Continuously Measurement Frequency: Hourly Recording Frequency**:** Monthly from Energy Meter, Summarized Annually Calibration Frequency**:** Once in a year Archiving Policy**:** Paper & / Electronic .
Monitoring frequency	**Measurement methods and procedures:** *Data Typed**:*** Calculated using export and import data from energy meter reading. *Monitoring equipment for import and export data**:*** Trivector Energy Meter. *Monitoring frequency:* continuously *Recording frequency:* monthly and aggregated annually *Archiving Policy**:*** Paper & Electronic
QA/QC procedures	The metering equipment is maintained in accordance with electricity standards and is of accuracy class 0.2. Every month these readings are recorded in the presence of plant personnel and KPTCL, which are archived for cross-checking. These meter readings are used to determine the electricity supplied to the grid by the project activity. The meters are in the custody of KPTCL and are calibrated every year. Records of meter reading are maintained at Project site.
Purpose of data	Calculation of baseline emission.
Additional comment	

Data / Parameter	**$EG_{facility1,y}$**
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data	From the Invoice raised
Value(s) applied	17,064 (This is estimated but actual net electricity generation is based on realistic scenario)
Measurement methods and procedures	The net electricity supplied to the grid is the difference of power exported to the grid (**$EG_{facility1, export\ y}$**) and power imported from the grid (**$EG_{facility1, importy}$**). This is a calculated value: **$EG_{facility1,y} = \{(EG_{facility1, export\ y}) - (EG_{facility1, importy})\}$** Monitoring Frequency**:** Continuously Measurement Frequency: Hourly Recording Frequency**:** Monthly from Energy Meter, Summarized Annually Calibration Frequency**:** Once in a year Archiving Policy**:** Paper & / Electronic A monthly Joint Meter Reading (JMR) is prepared and the summation of the same has been considered for the purpose of raising of Invoice and the same has been taken for emission reduction calculation
Monitoring frequency	**Measurement methods and procedures:** *Data Typed**:*** Calculated using export and import data from energy meter reading. *Monitoring equipment for import and export data**:*** Trivector Energy Meter. *Monitoring frequency:* continuously *Recording frequency:* monthly and aggregated annually *Archiving Policy**:*** Paper & Electronic
QA/QC procedures	The metering equipment is maintained in accordance with electricity standards and is of accuracy class 0.2. Every month these readings are recorded in the presence of plant personnel and KPTCL, which are archived for cross-checking. These meter readings are used to determine the electricity supplied to the grid by the project activity. The meters are in the custody of KPTCL and are calibrated every year. Records of meter reading are maintained at Project site.
Purpose of data	Calculation of baseline emission.
Additional comment	

Data / Parameter	$EG_{facility2, export\ y}$
Unit	MWh
Description	Quantity of electricity supplied by the project plant/unit to the grid in year *y*
Source of data	From the Joint Meter Reading (JMR)
Value(s) applied	12,437 MWh (This is estimated but actual electricity generation is based on realistic scenario)
Measurement methods and procedures	For measuring the export and import of energy by the project activity at the interconnection point, one set of tri-vector meter (main meter and check meter) is provided. The meter reading is recorded at the beginning of every month in the presence of both the PP representative and MESCOM representative and is called as joint meter reading. The monthly statements are prepared based on the same and is used for billing purpose. The meter is a two way meter in which both import and export is recorded. Hence the meter can also provide a net electricity supplied value. Monitoring Frequency**:** Continuously Measurement Frequency: Hourly Recording Frequency**:** Monthly from Energy Meter, Summarized Annually Calibration Frequency**:** Once in a year Archiving Policy**:** Paper & / Electronic
Monitoring frequency	**Measurement methods and procedures:** *Data Typed**:*** Calculated using export and import data from energy meter reading. *Monitoring equipment for import and export data**:*** Trivector Energy Meter. *Monitoring frequency:* continuously *Recording frequency:* monthly and aggregated annually *Archiving Policy**:*** Paper & Electronic
QA/QC procedures	The metering equipment is maintained in accordance with electricity standards and is of accuracy class 0.2. Every month these readings are recorded in the presence of plant personnel and KPTCL, which are archived for cross-checking. These meter readings are used to determine the electricity supplied to the grid by the project activity. The meters are in the custody of KPTCL and are calibrated every year. Records of meter reading are maintained at Project site.
Purpose of data	Calculation of baseline emission.
Additional comment	

Data / Parameter	$EG_{facility2, importy}$
Unit	MWh
Description	Quantity of electricity imported by the project plant/unit from the grid in year *y*
Source of data	From the Joint Meter Reading
Value(s) applied	0
Measurement methods and procedures	For measuring the export and import of energy by the project activity at the interconnection point, one set of tri-vector meter (main meter and check meter) is provided. The meter reading are recorded at the beginning of every month in the presence of both the PP representative and MESCOM representative and is called as joint meter reading. The monthly statements are prepared based on the same and is used for billing purpose. The meter is a two way meter in which both import and export are recorded. Hence the meter can also provide a net electricity supplied value. Monitoring Frequency**:** Continuously Measurement Frequency: Hourly Recording Frequency**:** Monthly from Energy Meter, Summarized Annually Calibration Frequency**:** Once in a year Archiving Policy**:** Paper & / Electronic
Monitoring frequency	**Measurement methods and procedures:** *Data Typed**:*** Calculated using export and import data from energy meter reading. *Monitoring equipment for import and export data**:*** Trivector Energy Meter. *Monitoring frequency:* continuously *Recording frequency:* monthly and aggregated annually *Archiving Policy**:*** Paper & Electronic
QA/QC procedures	The metering equipment is maintained in accordance with electricity standards and is of accuracy class 0.2. Every month these readings are recorded in the presence of plant personnel and KPTCL, which are archived for cross-checking. These meter readings are used to determine the electricity supplied to the grid by the project activity. The meters are in the custody of KPTCL and are calibrated every year. Records of meter reading are maintained at Project site.
Purpose of data	Calculation of baseline emission.
Additional comment	

Data / Parameter	**$EG_{facility2,y}$**
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data	From the Invoice raised
Value(s) applied	12,437 (This is estimated but actual net electricity generation is based on realistic scenario)
Measurement methods and procedures	The net electricity supplied to the grid is the difference of power exported to the grid (**$EG_{facility2, export\ y}$**) and power imported from the grid (**$EG_{facility2, importy}$**). This is a calculated value: **$EG_{facility2,y} = \{(EG_{facility2, export\ y}) - (EG_{facility2, importy})\}$** Monitoring Frequency**:** Continuously Measurement Frequency: Hourly Recording Frequency**:** Monthly from Energy Meter, Summarized Annually Calibration Frequency**:** Once in a year Archiving Policy**:** Paper & / Electronic A monthly Joint Meter Reading (JMR) is prepared and the summation of the same has been considered for the purpose of raising of Invoice and the same has been taken for emission reduction calculation.
Monitoring frequency	**Measurement methods and procedures:** *Data Typed**:*** Calculated using export and import data from energy meter reading. *Monitoring equipment for import and export data**:*** Trivector Energy Meter. *Monitoring frequency:* continuously *Recording frequency:* monthly and aggregated annually *Archiving Policy**:*** Paper & Electronic
QA/QC procedures	The metering equipment is maintained in accordance with electricity standards and is of accuracy class 0.2. Every month these readings are recorded in the presence of plant personnel and KPTCL, which are archived for cross-checking. These meter readings are used to determine the electricity supplied to the grid by the project activity. The meters are in the custody of KPTCL and are calibrated every year. Records of meter reading are maintained at Project site.
Purpose of data	Calculation of baseline emission.
Additional comment	

Data / Parameter	**$EG_{BL,y}$ ($(EG_{facility1,y} + EG_{facility2,y})$**
Unit	MWh
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y. ($EG_{BL,y}$ is calculated by addition on of **$EG_{facility1,y} + EG_{facility2,y}$.)** Quantity of net electricity generation supplied by the AHSHP and CMHS project plant/unit to the grid in year *y*
Source of data	From the Invoice raised
Value(s) applied	29,501 (This is estimated value)
Measurement methods and procedures	Monitoring Frequency**:** Continuously Measurement Frequency: Hourly Recording Frequency**:** Monthly, Summarized Annually Calibration Frequency**:** Once in a year Archiving Policy**:** Paper & / Electronic The net electricity supplied to the grid by AHSHP and CMHS Projects. A monthly Joint Meter Reading (JMR) is prepared for AHSHP Project and CMHS Project and the summation of the same has been considered for the purpose of emission reduction calculation. $EG_{BL,y} = EG_{facility1,y} + EG_{facility2,y}$
Monitoring frequency	**Measurement methods and procedures:** *Data Typed:* Calculated using export and import data from energy meter reading. *Monitoring equipment for import and export data:* Trivector Energy Meter. *Monitoring frequency:* continuously *Recording frequency:* monthly and aggregated annually *Archiving Policy:* Paper & Electronic Net energy supplied is **measured & calculated** continuously and recorded monthly. A monthly Joint Meter Reading (JMR) is prepared for AHSHP Project and CMHS Project and the summation of the same has been considered for the purpose of emission reduction calculation.
QA/QC procedures	The metering equipment is maintained in accordance with electricity standards and is of accuracy class 0.2. Every month these readings are recorded in the presence of plant personnel and KPTCL, which are archived for cross-checking. These meter readings are used in the calculations to determine the electricity supplied to the grid by the project activity. The meters are in the custody of KPTCL and are calibrated every year. Records of meter reading are maintained at Project site.
Purpose of data	Calculation of baseline emission.
Additional comment	

Data / Parameter	$FC_{diesel, y}$
Unit	Mass or volume unit per year
Description	Quantity of diesel combusted in the project activity during year y
Source of data	On-Site measurements
Value(s) applied	-
Measurement methods and procedures	Measurement Procedure: The total number of operating hours of DG set and the quantity of diesel consumed in the project activity will be recorded in the log book maintained at the DG set room. Before pouring the diesel into the DG set, Shift in Charge shall measure the amount of diesel and entered into the log book. Dip stick/level gauge is used for measurement of diesel. Monitoring Frequency**:** Continuously Measurement Frequency: Daily Recording Frequency**:** Monthly, Summarized Annually Calibration Frequency**:** Once in a year Archiving Policy**:** Paper & / Electronic Accuracy of the Measurement Method: To confirm the accuracy on measurement of quantity of diesel consumed in the project activity can be cross checked against the fuel purchase receipts. Responsibility: Log book sheet would be maintained by the shift in charge and same would be crossed checked by the General Manager of the project activity.
Monitoring frequency	*Frequency:* continuously & as and when consumed *Recording frequency:* monthly and aggregated annually *Archiving Policy:* Paper & Electronic
QA/QC procedures	The data recorded can be cross checked against the fuel purchase receipts/invoices.
Purpose of data	Calculation of project emissions
Additional comment	.

B.7.2. Sampling plan

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The data and parameters mentioned in section B.7.1 are not determined by sampling approach. Hence sampling plan is not applicable.

B.7.3. Other elements of monitoring plan

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This monitoring plan is developed in accordance with the modalities and procedures for small-scale CDM project activities and is being implemented in Aniyur Hole Small Hydro Project and Charmadi Mini Hydel Scheme in Karnataka, India. The monitoring plan being implemented by the project proponent, describes about monitoring organization, parameters to be monitored, monitoring practices, QA and QC procedures, data storage and archiving.

Procedures for documentation and storage:

The Plant operators would record the parameters every day during the operation of the plant. Since the project is a hydel power project only net electricity supplied by the project to the grid and diesel consumption for the DG set needs to be monitored. The Energy meter readings would be taken during a particular time of every day to ensure constant recording frequency of parameter. The recorded parameters would be documented every day in the standard log-books maintained at the plant.

The day-to-day records would be verified by plant manager, compiled and documented for preparation of internal audit reports.

The company might introduce an internal audit system for documentation and safe storage of data. Internal auditing would be carried out as per the monitoring plan and whenever necessary. An internal audit report would be prepared for review by the higher authorities. The internal auditor could be an outside entity or one of the senior managers of the plant. The internal auditor would be required to verify the records independently with reference to the power exported and imported. The reports would be submitted periodically to the Chief Engineer designated.

Internal audit reports are the basic documents for the monitoring and storage of plant operational data.

Procedures for Corrective actions

The parameters to be monitored during a crediting period would be compiled as internal audit report for every quarter of each crediting year and submitted to the specified higher authorities of the board for review. The parameters include the net electricity supplied by the project to the grid and diesel consumption for the DG set. Based on the audit report submitted by plant manager the Chief Engineer would assess the performance of plant. The Chief Engineer would discuss and recommend necessary mechanism to improve the operational efficiency of the plant and directs the respective person to rectify the problem.

The report would also cover comments on variations in the records with reference to the above parameters compared to the records maintained. The specified authorities in the Board would consider these variations in their review meeting and instruct the concerned personnel of the plant to rectify the variations and report the action taken in the next review meeting.

Monitoring organization

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data sets with the Board of Directors of IPCPL (for both “AHSHP & CMHS) who may delegate the same to a competent person identified for the purpose. The identified person, in the rank of General Manager, will be in-charge of GHG monitoring activities within project’s functioning. The General Manager will be assisted by a team of experienced personnel in disciplines such as mechanical and electrical with experience in plant operations, measurements and management. The primary responsibility of the team is to measure, monitor, and record and report the information on various data items to the General Manager in accordance with the applicable standards. Periodic calibration of the various instruments used in the monitoring of GHG related data and record keeping of the same also will be the responsibility of the team.

The responsibility of review, storage and archiving of information in good condition lies with the General Manager of IPCPL. The General Manager will undertake periodic verification and onsite inspections to ensure the quality of data collected by the team and initiate steps in case of any abnormal conditions. The General Manager will review the data collected by the team and suggest corrective actions wherever required. An internal audit report will be prepared for review by the Board of Directors which will be later submitted for verification by an independent entity (DOE). Board of Directors will examine the internal audit reports and will in particular take not of any deviations in data over the norms and monitor that the corrective actions have resulted in adherence to the standards.

The team including the General Manager will be appointed by Board of Directors, advance before the start of project operations. The General Manager will report to the Board of Directors and seek guidance in case of conflicts or difficulties in order to maintain the monitoring organization in good spirit.

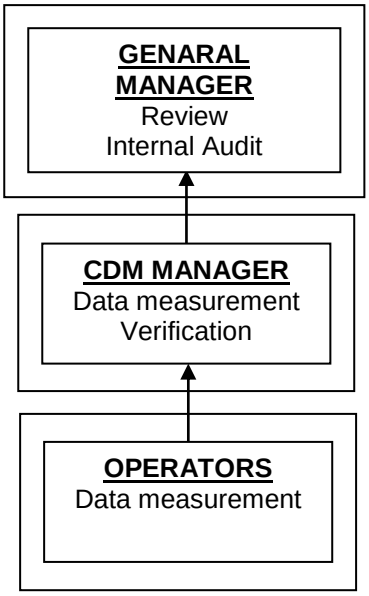
Parameters requiring monitoring

This monitoring plan requires monitoring of one parameter that is the power exported to the KPTCL grid system. Necessary documents required for the verification of the data will be maintained for later archiving. Using the power exported to the grid, emission reductions will be estimated as illustrated in Section B.6. Emission reductions generated by the project will be monitored at regular intervals and will be reported to the Board of Directors.

Data storage and archiving

All the data items monitored under the monitoring plan will be kept for 2 years after the end of crediting period or till the last issuance of CERs for this project activity whichever occurs later. The monitored data will be presented to an independent verification agency or DOE to whom verification of emission reductions will be assigned.

Management structure for monitoring the emission reduction



All the parameters mentioned in the monitoring plan will be monitored in the plant. The entire process of monitoring will be streamlined and will be made available in the required format during verification process and for subsequent useful purposes.

The calibration of monitoring equipment will be maintained as per the requirement of KPTCL. Power generation, auxiliary consumption and export will be recorded and the same will be verified and approved by the manager of the plant. These records will be sent to the head office for review by the Managing Director and for corrective actions if necessary.

The plant will be equipped with energy meters/export meters for monitoring and control purpose. There will be two energy meters at KPTCL sub-station to measure the export power, namely main meter and check meter. The energy meters shall be tested and calibrated utilizing a standard meter. The standard meter shall be calibrated once in a year at the approved laboratory of Govt. of India or Govt. of Himachal Pradesh as per terms and conditions of supply. The tests of meters shall be jointly conducted by authorized representatives of both the parties and the results and corrections so arrived at mutually will be applicable and binding on both the parties. The energy meters shall not be interfered with, tested or checked except in presence of representatives of company and KPTCL. If any of the meters is found to be registered inaccurately, the affected meter shall be replaced immediately. The meters will be checked in the presence of both the parties on mutually agreed periods. If during the test checks both the meters are found beyond

permissible limits of error, both the meters shall be immediately replaced and the correction applied to the consumption registered by the main meter to arrive at the correct energy exported for billing purposes for the period of one month up to the time of test check, computation of exported energy for the period thereafter till next monthly reading shall be as per the replaced meter.

Corrections in exported energy shall be applicable to the period between the two previous monthly reading and the date and time of test calibration in the current month when error is observed. Power generation, power export to the grid will be recorded at the plant from the two meters i.e. main meter, check meter installed inside the powerhouse of the plant. However, for applying monthly bill to KPTCL the meter readings will be taken every month by KPTCL officials in presence of company representatives and readings will be jointly certified.

The following log sheets are being maintained for the critical equipment of the plant and readings will be recorded on day to day basis:

1. Turbine Log
2. Electrical Log

If both check meters fail to record or if any of the PT fuses are blown out, the export energy will be computed on a mutually agreeable basis for any such period of monitoring.

B.7.4. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

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The study and application of baseline methodology was completed on 15/06/2013.

Contact Details (The person/entity is not a Project Participant):
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SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>
AHSHP 08.11.2006 (Date of Placement of Civil Work Order) and CMHS 16.11.2006 (Date of Placement of Civil Work Order)

C.1.2. Expected operational lifetime of project activity

>>
35 years (CERC Regulations)[17]

[17] http://www.cercind.gov.in/131205/appendix_2.pdf

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>
The project proponent has chosen “Renewal crediting period”. This is the first renewable crediting period.

C.2.2. Start date of crediting period

>>
10/01/2015 or from the date of complete submission to the UNFCCC, whichever is later.

C.2.3. Length of crediting period

>>
07 Years 0 Months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
The Ministry of Environment & Forest (MoEF), Government of India, vide Notification No. SO. 1533 dated 14th September, 2006[18] requires EIA clearance of the Project activities listed in Schedule. As per the regulation and further amendment[19] of the Ministry of Environment and Forest of India (MOEF), the Hydro power projects with the proposed plant capacity does not require to obtain the Environmental clearance from the concerned regulatory authorities.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>
The project proponent of the proposed power project activity conducted the Stakeholders Consultation (SHC) meeting on 30.07.2007 at project sites to account for the views of the people impacted either directly or indirectly due to the project activity. The objective of the SHC meetings was to inform the stakeholders on the environmental and social impact of the small scale project activity and to discuss their concerns regarding it. The invitations for the meeting were sent out requesting the stakeholders to participate and communicate any suggestions/objections regarding the same. *Prior to implementing the project, project investors / developers met below mentioned stakeholders, and obtained required clearances / approvals.*

The local stakeholders identified for the project activity are as follows:

1. Local People
2. Gram Panchayat members of Kakkanje and Aniyur village, directly coming under the purview of the projects.
3. District and state level government officials
4. Representatives of Aniyur Hole SHP and Charmadi Mini Hydel Scheme Limited.

. The discussions mainly aimed at–

1. Significant impact in the region due to the project

[18] http://envfor.nic.in/legis/eia/so1533.doc

[19] http://moef.nic.in/divisions/iass/3067_cir.pdf

2. Are there any possible impacts in the long run
3. To understand stakeholder perceptions
4. Stakeholder awareness of project related issues

E.2. Summary of comments received

>>

The project received positive comments from stakeholders; comments received from the stakeholders have been summarized below:

- The presence of the project has also ensured employment opportunities and infrastructure development in the project region.
- The project does not require any major displacement of local population. That there are no apparent trends to indicate that the project has resulted in adversely affecting the livelihood, health, availability of water and other necessities of life in the region

E.3. Report on consideration of comments received

>>

The stakeholders expressed their views and welcomed the project activity. They also conveyed their best wishes to the success of the project activity. Since there were no negative comments received from the stakeholders, therefore, it was not necessary to take due account of any comments.

SECTION F. Approval and authorization

>>

PP had received Letter of approval No: 04/29/2011-CCC dated 29th February 2012 from host party (India).

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

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	International Power Corporation Private Limited
Street/P.O. Box	#19, 3rd floor,
Building	Shivashankar Plaza, Lalbagh road
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State/Region	Karnataka
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E-mail	bpr@internationalpower.in
Website	www.internationalpower.in
Contact person	B P Ramesh
Title	Director
Salutation	Mr.
Last name	Ramesh
Middle name	
First name	
Department	
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Direct fax	+91 80 22100052
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Personal e-mail	bpr@internationalpower.in

Project participant and/or responsible person/ entity	☐ Project participant ☒ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Kosher Climate India Private Limited
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Document information

Version	*Date*	*Description*
05.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the project design document form for small-scale CDM project activities (these instructions supersede the "Guidelines for completing the project design document form for small-scale CDM project activities" (Version 01.1)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and **Error! Reference source not found.**; • Change the reference number from *F-CDM-SSC-PDD* to *CDM-PDD-SSC-FORM*; • • Editorial improvement.
04.1	11 April 2012	Editorial revision to change history box by adding EB meeting and annex numbers in the Date column.
04.0	13 March 2012	EB 66, Annex 9 Revision required to ensure consistency with the “Guidelines for completing the project design document form for small-scale CDM project activities”
03.0	15 December 2006	EB 28, Annex 34 • The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.
02.0	08 July 2005	EB 20, Annex 14 • The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
01.0	21 January 2003	EB 07, Annex 05 Initial adoption.

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