Project design document form for CDM project activities

(Version 08.0)

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

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	Thangarabalu Small Hydel Project at Karnataka
Version number of the PDD	3.1
Completion date of the PDD	25/08/2016
Project participant(s)	Kare Power Resources Private Limited. (KPRPL)
Host Party	India
Applied methodology(ies) and, where applicable, applied standardized baseline(s)	ACM0002, Version 13.0.0
Sectoral scope(s) linked to the applied methodology(ies)	01
Estimated amount of annual average GHG emission reductions	53,983 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>

The project activity, promoted Kare Power Resources Private Limited (KPRPL), is a run-of-river 24.75 MW (2 * 12.375 MW) hydro power project across the river Krishna – approximately 13 km downstream the river Krishna at Yalagundhi Village, Lingasugur Taluk, Raichur district, Karnataka, India.

The purpose of the project activity is to utilize the potential energy available in flowing water for power generation and promote sustainable development in the region. The process involves converting kinetic energy available in the water flow into mechanical energy using hydro turbines and then to electrical energy using alternators. The project is estimated to generate 65 Million kWh of power annually, once commissioned.

Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources.
As the project is a Greenfield project activity, the baseline scenario is the same as the scenario existing prior to the start of the project activity i.e. the electricity demand was met by the power plants already operating in the grid (dominated by fossil fuel based power plants) and planned to be added to the grid. Thus the project will lead to, on an average the displacement of 53,983 tCO_2 emissions annually and will lead to 539,830 tCO_2 over the entire crediting period.

Contribution of the project activity to Sustainable Development
The four indicators[1] stipulated by the NCDMA (National CDM Authority) which is the DNA (Designated National Authority) of India, for defining sustainable development are:

- Social well being
- Economic well being
- Environmental well being
- Technological well being

The Project participant contribution from the project activity towards sustainable development in accordance to NCDMA is explained below:

A. Social well being –

- The project is implemented in a rural area that does not have proper roads and other infrastructure facilities. The project activity would augment infrastructural development like roads etc. in the area, thus benefitting local communities.
- The project activity would lead to enhanced direct and indirect employment opportunities at all levels from unskilled to skilled workers.

B. Economic well being –

- The project activity involves capital investments, thus leading to the overall development of the region.
- The project activities would also lead to enhanced business opportunities for local stakeholders like consultants, suppliers, manufacturers, contractors etc. All this would lead to improved financial security and overall development of the region.

C. Environmental well being –

[1] http://www.cdmindia.in/approval_process.php

- The project activity being run-of-the-river power project will have minimum environmental impact as compared to a reservoir based hydro power plant.
- Contribute in bridging the demand-supply gap of electricity by producing green energy
- The electricity generated by the project activity will be supplied to the Southern grid, which otherwise would have been generated by fossil fuel fired power plants in the grid.
- The project activity also helps in conservation of depleting fossil fuels which at present are predominantly used for power generation.

D. Technological well being –

- The project activity is a clean and eco-friendly type of power generation in comparison to fossil fuel based projects. This not only helps reduce environmental pollution but also helps in conserving fossil fuels.

A.2. Location of project activity

A.2.1. Host Party

>>
India

A.2.2. Region/State/Province etc.

>>
Karnataka

A.2.3. City/Town/Community etc.

>>
Yalagundhi Village, Lingasugur Taluk, Raichur district

A.2.4. Physical/Geographical location

>>
The project activity is located across the river Krishna – approximately 13 km downstream of Narayanpura dam near Yalagundhi Village, Lingasugur Taluk, Raichur district, Karnataka, India. The project is at a distance of about 120 km from the nearest district town of Raichur, which is the nearest important railhead and can be reached via Lingsugur.

Latitude: 16° 16’ 33” N i.e, 16.276 N[2]
Longitude: 76° 28’ 08” E i.e, 76.469 E

Approximate location maps of the projects are furnished below:

[2] http://transition.fcc.gov/mb/audio/bickel/DDDMMSS-decimal.html


INDIA
States and Union Territories
N
PAKISTAN
CHINA (TIBET)
NEPAL
BHUTAN
BANGLADESH
MYANMAR
JAMMU & KASHMIR
Srinagar
HIMACHAL PRADESH
Shimla
Chandigarh
PUNJAB
UTTARANCHAL
Dehradun
HARYANA
DELHI
RAJASTHAN
Jaipur
UTTAR PRADESH
Lucknow
SIKKIM
Gangtok
ARUNACHAL PRADESH
Itanagar
ASSAM
Dispur
NAGALAND
Kohima
Shillong
MEGHALAYA
Imphal
MANIPUR
Agartala
TRIPURA
Aizawl
MIZORAM
Patna
BIHAR
Ranchi
JHARKHAND
WEST BENGAL
Calcutta
GUJARAT
Gandhinagar
Bhopal
MADHYA PRADESH
CHHATTISGARH
Raipur
ORISSA
Bhubaneshwar
DIU
DAMAN
DADAR & NAGAR HAVELI
MAHARASHTRA
Mumbai (Bombay)
Hyderabad
ANDHRA PRADESH
YANAM (Pondicherry)
BAY OF BENGAL
ARABIAN SEA
Panaji
GOA
KARNATAKA
Bangalore
Chennai (Madras)
PONDICHERRY (Puduchchery)
KARAIKAL (Pondicherry)
LAKSHADWEEP
MAHE (Pondicherry)
TAMILNADU
KERALA
Thiruvananthapuram
Port Blair
ANDAMAN & NICOBAR ISLANDS


KARNATAKA
Note: This map is not drawn to scale and for guidance only
24 National Highways
Other Roads
Rail Routes
Panaji State Capitals
BIJAPUR Major Towns
Halebidu Other Centres
Jog Falls Tourist Centres
MAHARASHTRA
SATARA
Pandharpur
Sangole
SOLAPUR
Umarga
BIDAR
Homnabad
NIZAMABAD
Kamareddi
Medhak
SANGAREDDI
Secunderabad
HYDERABAD
NALGONDA
RATNAGIRI
SANGLI
Miraj
KOLAPUR
Jath
Afzalpur
Chincholi
GULBARGA
Wadi
Farruknagar
Rajapur
Basavana Bagevadi
Kudachi
BIJAPUR
Yadgir
MAHABUBNAGAR
Jadcherla
Devarkonda
Nippani
Mudhol
Almatti
Shorapur
Krishna
ANDHRA
KUDAL
Gokak
Aivalli
Hungund
Lingsugar
RAICHUR
BELGAUM
Badami
Pattadakal
Mantralayam
KURNOOL
Atamkur
PANAJI
MARGAO
GOA
Londa
DHARWAD
Kushtaji
Adoni
PRADESH
Nandyal
Dandeli
Hubli
Gadag
Hampi
Hospet
BELLARY
Guntakal
Gooty
KARWAR
Yellapur
STATE
Swamihalli
Sirsi
Harpanahalli
Kotturu
ANANTHAPUR
www.indtravel.com
Kumta
Davengere
CUDAPPAH
Dharmavaram
Jog Falls
Talguppa
CHITRADURGA
Puttaparti
Penukonda
Batkal
Chikjajur
Rayachoti
Kollur
SHIMOGA
Hosdurga
Kundapura
Lepakshi
Sringeri
KARNATAKA
Sira
Udupi
CHIKMANGLUR
Arsikere
TUMKUR
Horsely Hills
Nandi
Chik Ballapur
Kudremukh
Belur
Halebidu
Kibbanahalli
CHITTOOR
Dharmastala
BANGALORE
HASSAN
KOLAR
MANGALORE
Puttur
Sravanabalagola
VELLORE
Subramanya
Hosur
KASARGOD
MADIKERI
MANDYA
Krishnagiri
Jolarpettai
Hosdurg
Tale Kaveri
Srirangapattana
Sivasamudram
TIRUVANNAMALAI
Payyannur
MYSORE
Nanjangud
Hoganakal
DHARMAPURI
KANNUR
Talassery
Chamrajnagar
Bandipur
Mettur
SALEM
KALPATTA
Mudumalai
Bhavani
KOZHIKODE
KERALA
UDAGAMANDALAM
ERODE
PERAMBUR
Avanashi
NAMAKKAL
MALAPURAM
COIMBATORE
TAMIL NADU
ARABIAN SEA

A.3. Technologies and/or measures

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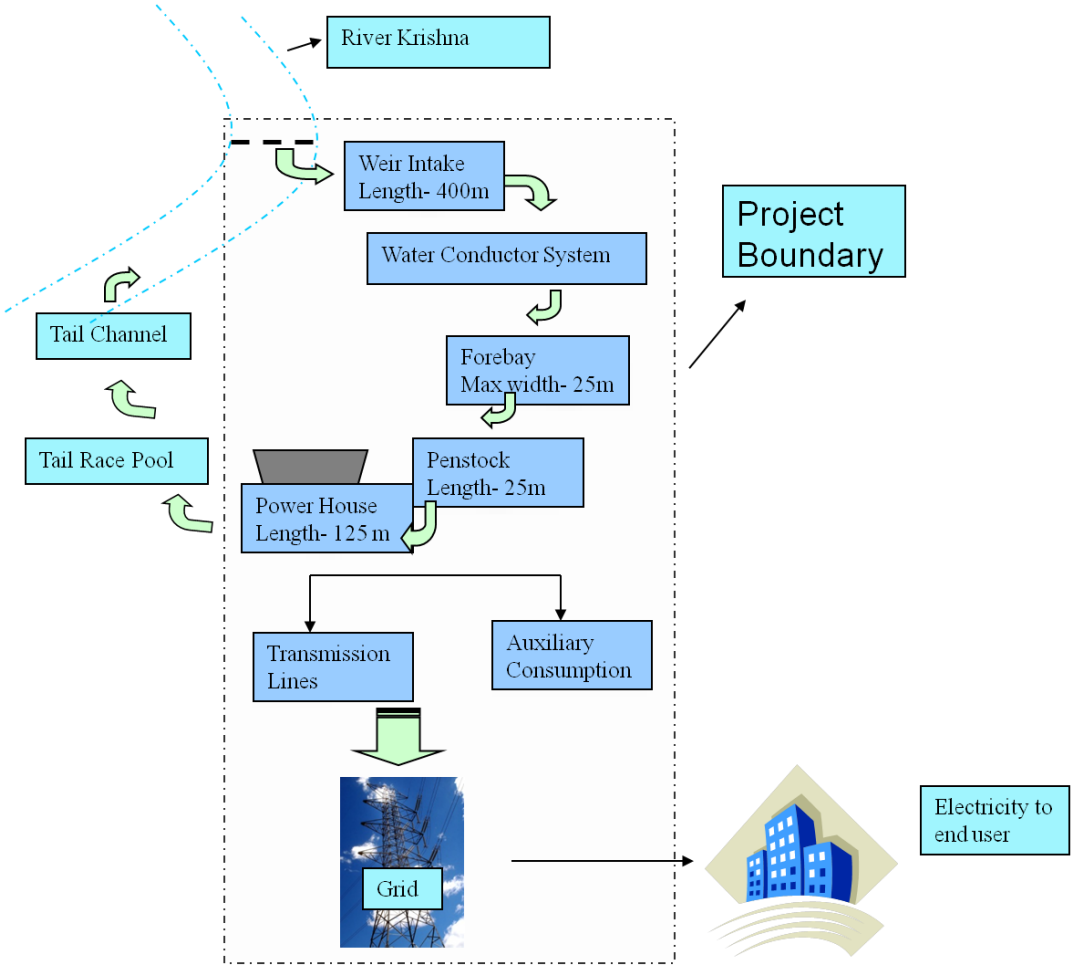
The project is expected to be implemented as a 2 no. x 12.375 MW (24.75 MW) turbine-generator configuration. The type of turbine will be vertical shaft full Kaplan type with adjustable guide vanes and adjustable runner blades. The main features of the project are provided below:

Turbine	**Parameters**
Rated flow	65 m^3/s
Rated net head	25m
Runner diameter	3100 mm
Rated Speed	214.3 rpm
Diversion Structure	**Parameters**
Length (overflow portion)	400
River bed Level	RL 402.00 m
Crest Level of diversion structure	RL 424.00 m
Normal pond level	RL 424.00 m
Scouring Sluice Size	1.2 m x 1.2 m (4 nos)
Power Canal	**Parameters**
Length	2100 (approx)
Type	Trapezodial
Material	CC Lined
Design flow	160m3/s
Base Width	16m
Bed Slope	1:2000
Forebay	**Parameters**
Maximum Width of Forebay	25m
Length of forebay	150m
Penstock	**Parameters**
Number	2
Material	Steel
Length	25m
Internal Diameter	4.6 M
Power House	**Parameters**
Location	On right bank
Installed Capacity	24.75 W (12.375 X 2)
Powerhouse size	45m X 28 m
Tail race channel	Length- 125 m Base width- 40 m

KPRPL proposes to install two 11kV, 12.375 MW, 0.85 of synchronous generators. The generators will be connected to a 11kV indoor switchgear. The voltage will be stepped up to 110 kV by means of one 36 MVA, 11/110 kV, 3 phase step-up transformer and power will be evacuated to existing KPTCL 220/110 kV sub-station at Lingsugur. The project is expected to generate about 65 Million kWh of power annually operating at a capacity utilization factor of 30%.

There is no transfer of technology proposed for the project activity. Construction activities for the project shall start in November 2012 and the project is likely to be commissioned by July 2013.



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 Country)	Kare Power Resources Private Limited (Private Entity)	No

A.5. Public funding of project activity

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No public funding from parties included in Annex – I is proposed for the project activity. Hence there is no ODA (Official Development Assistance) flowing to the project activity

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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Title of the approved baseline and monitoring methodology: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

Reference: ACM0002, Version 13.0.0 (EB 67), Sectoral Scope: 1
The methodology has been referred from the list of approved methodologies for CDM project activities in the UNFCCC website (http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html)

This methodology also draws upon Version 7.0 of the "Tool for demonstration and assessment of additionality" and Version 03.0.0 of the "Tool to calculate the emission factor for an electricity system".

B.2. Applicability of methodology and standardized baseline

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S.No.	Applicability Conditions in the ACM0002/ Version 13.0.0	Position of the project activity vis-a-vis applicability conditions
1.	*The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit*	The project activity involves the installation of a Greenfield hydro power project (run-of-river) for renewable electricity generation on the Krishna river in Karnataka. Thus, it meets the first applicability criteria.
2.	*In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter EGPJ,y): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity*	Being a green field project it does not entail any capacity additions, retrofits or replacements. Therefore this criterion is not applicable.
3.	*In case of hydro power plants, one of the following conditions must apply:* - *The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or* - *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*	The project activity is a run-of-river hydro power project. It involves creation of a diversion weir to get required head and thus implementation will result in the formation of new pondage for operation of the project activity. The pondage is created due to the weir and it will not be used for generating power, since the volume of water will be minimal and not of the capacity to generated power. Further, the pondage creation is not done intentionally for power

	greater than 4 W/m^2; or - *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/m^2.* *In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m2 all the following conditions must apply:* • *The power density calculated for the entire project activity using equation 5 is greater than 4 W/m2;* • *Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project1 that collectively constitute the generation* • *capacity of the combined power plant;* • *Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity;* • *Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m2, is lower than 15 MW;* • *Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.*	generation or storage purposes. It will be created due to the weir. The power density of the same is26.33 W/m2 which is greater than 4 W/m2. Cap_{PJ} = 24750000 W Cap_{BL} = 0 m^2 A_{BJ} = 940000[3] m^2 A_{BL} = 0 m^2 Therefore, PD = (24750000 – 0)/(9400000 – 0) = 26.33 W/m^2 Thus, the applicability criterion is satisfied.
6.	*The methodology is not applicable to the following:* • *Project activities that involve switching fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;* • *Biomass fired power plants*	This is a Greenfield project activity and involves only renewable energy, hence switching from fossil fuels to renewable energy at the project site is not involved. Hence, this condition is not applicable to the said project activity. This is not a biomass fired power plant

[3]The computation of this area is as follows –

$$V = H/3*[A_1 + A_2 + \sqrt{A1 * A2}\ ]$$

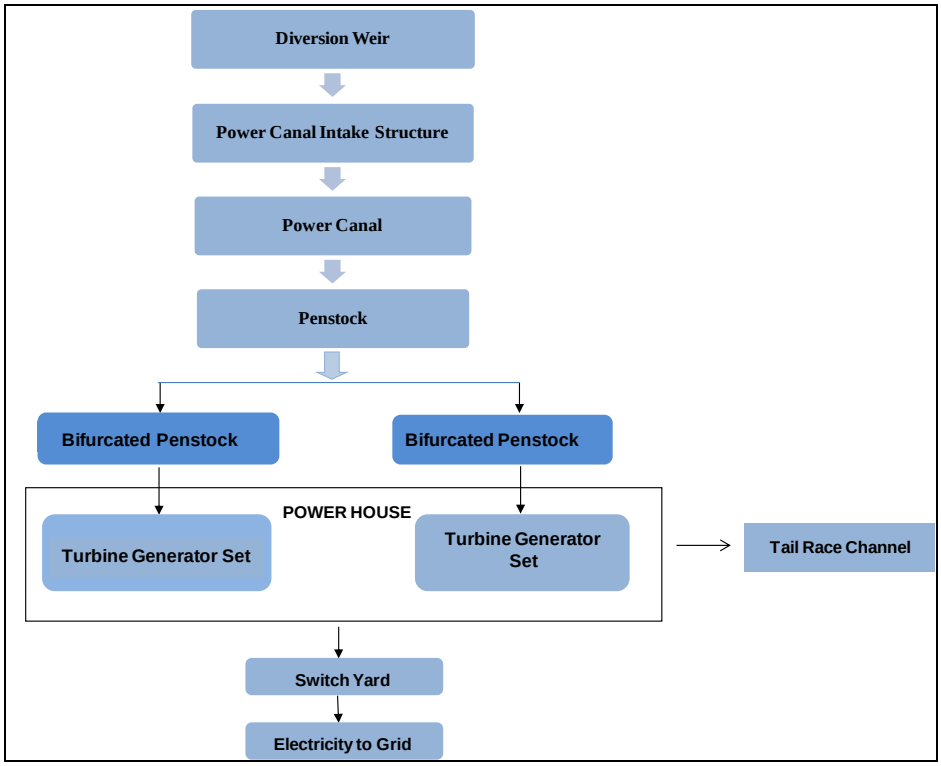
The topographical survey and auto cad software have been used to arrive at the elevation area.

	• *Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4W/m^2*	The said project activity is a run-of-river hydro electric project and doesn't require reservoirs. Hence, the applicability condition is satisfied.

B.3. Project boundary

As per the applied methodology of ACM0002 Version 13, *"The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system[4] that the CDM project power plant is connected to".*

Therefore, the project boundary for the proposed project activity is:



[4]As per Tool to calculate the emission factor for an electricity system, Version 02.2.1 EB63, *"**A grid/project electricity system** is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints".*

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Source 1: CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project scenario	Source 1: For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	No	The project activity is a run-of-the-river hydroelectric power project. Hence these emission sources are not applicable to the proposed project.
		CH_4	No	
		N_2O	No	
	Source 2: CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	The project activity is a run-of-the-river hydroelectric power project. Hence these emission sources are not applicable to the proposed project.
		CH_4	No	
		N_2O	No	
	Source 3: For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	The power density of the project activity is 26.33W/m2 Since the power density is greater than 10W/m^2, the project activity emissions are not required to be estimated and are taken as zero.
		CH_4	No	
		N_2O	No	

B.4. Establishment and description of baseline scenario

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The step wise methodology followed for the selection of baseline scenario is detailed below:

Identification of baseline scenario

The project activity is a newly installed and grid connected run-of-river hydro power project and is not a modification or retrofit of an existing electricity generation facility. Hence as per the methodology ACM0002 ver13.0.0, the baseline scenario is the following:

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, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$BE_y = EG_{PJ,Y} * EF_{grid,CM,y}$

Where:

BE_y = *Baseline emissions in year y (tCO_2)*

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

$EF_{grid,CM,y}$ *=Combined margin CO2 emission factor for grid connected power generation in year y*
calculated using the latest version of the .Tool to calculate the emission factor for an electricity system. (tCO2/MWh)

Therefore, the most plausible baseline scenario for this project activity would be the continued supply of electricity to the Southern regional grid through fossil fuel based power plants.

The consolidated methodology ACM0002 version 13.0.0 requires calculation of the combined margin CO2 emission factor for grid connected power generation using the version 03.0.0 of the "Tool to calculate the emission factor for an electricity system". This tool determines the combined margin CO2 emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the "operating margin" (OM) and "build margin" (BM). The operating margin refers to group of power plants that reflect the existing power plants whose electricity generation would be affected by the proposed CDM project activity. The build margin refers to a group of power units that reflect the type of power units whose construction would be affected by the proposed CDM project activity.

There is no generic guidance provided by DNA in India for selection of grid and India being a large country with multiple states and regions; the regional grid definition is taken as per Version 03.0.0 of the "Tool to calculate the emission factor for an electricity system".

The version 03.0.0 of "Tool to calculate the emission factor for an electricity system" specifies that, "the project electricity system is defined by 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". So, the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to (i.e. Southern Grid in our project case).

There are two independent regional grids in India: Northern, Eastern, Western, North-Eastern (NEWNE) and Southern grid. The project activity is in the state of Karnataka, which is connected to the Southern regional grid, hence all power plants connected with the southern grid have been considered within project grid boundary. Grid emission factors are most appropriately calculated at the level of two regional grids as per CEA EF database's version 7 released in January 2012. The project in consideration is located in Karnataka state, in the southern region and is connected to the Southern regional grid; thus the Southern Regional Grid can be appropriately identified as the relevant electricity grid.

"Ex ante" option of data vintage has been chosen by the project proponent for the project activity. At the time of finalization of PDD; data for the three most recent years (2008-09, 2009-10, 2010-11) was available. This has been considered for the BM calculation. Details of variables, formulae for calculating OM and BM have been dealt with in section B.6 of the PDD.

The combined margin EF is calculated as the weighted average of the OM emission factor and the BM emission factor. OM and BM EFs are calculated using the power generation data published by Central Electricity Authority of India (CEA) in the "CO2 Baseline Database for the Indian Power Sector" Version 7.0 published in January 2012. Since the project activity is a hydro electric power plant; the weightage factor of OM is taken as 0.50 and for BM is taken as 0.50 as per Version 03.0.0 of the "Tool to calculate the emission factor for an electricity system".

The Combined Margin has been calculated on basis of publicly available data from CEA (Central Electricity Authority of India), "CO2 Baseline Database for the Indian Power Sector", Version 7, published on January 2012.

The baseline emission factor ($EF_{grid,}CM,_y$) is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors calculated according to version 03.0.0 of "Tool to calculate the emission factor for an electricity system", using the following six steps:

Step 1: Identify the relevant electricity systems

As explained in the section B.4 above, Southern grid has been identified as the relevant electric power system in this case.

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

Since majority of the power generated in India is fed into the regional grids, the project activity doesn't include off-grid power plants in the project electricity system.

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

Version 03.0.0 of the "Tool to calculate the emission factor for an electricity system" provides four options for calculating the operating margin emission factor ($EF_{grid, OM, y}$) and guidance for choosing the option for the corresponding project activity. The options are:

a) Simple OM, or
b) Simple adjusted OM, or
c) Dispatch Data Analysis OM, or
d) Average OM.

The tool states that any of the four above methods can be used. In the current project activity, simple OM method has been chosen to calculate the operating margin emission factor ($EF_{grid, OM, y}$).

According to the Version 03.0.0 of the "Tool to calculate the emission factor for an electricity system", Simple OM method (option a) can only 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

In the context of Version 03.0.0 of the "Tool to calculate the emission factor for an electricity system", low cost/must run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)

	2006-07	2007-08	2008-09	2009-10	2010-11
NEWNE	18.5%	19.0%	17.4%	15.9%	17.6%
South	28.3%	27.1%	22.8%	20.6%	21.0%
India	20.9%	21.0%	18.7%	17.1%	18.4%

Ref: CO2 Baseline Database for the Indian Power sector – CEA, Version 7, January 2012

Percentage of total grid generation by low cost/ must run plants in the southern grid (on basis of average of five most recent years) = 24%

The calculation above shows that the generation from low cost/ must run resources constitutes less than 50% of the total grid generation; hence usage of the Simple OM method for the project activity is justified.

In terms of data vintage, the Simple OM emission factor can be calculated using either of the two following data vintages for year(s) y:

- *Ex ante option: In this method, a 3-year generation-weighted average has to be calculated based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without the requirement to monitor and recalculate the emissions factor during the crediting period,*

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 for calculating the emission factor for year y is usually only available later than six months after the end of the 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, y-2) should be used throughout all crediting periods.*

In this case, Ex ante option has been chosen for estimating simple OM emission factor wherein as described above, 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) during the crediting period will be undertaken, without requirement to monitor and/ or recalculate the emission factor.

Step 4: Calculate the operating margin emission factor according to the selected method
Amongst the four options identified in Step 3 above, the Simple Operating Margin is used for the project activity as justified above.

Simple OM: The simple OM emission factor ($EF_{grid,OMsimple,y}$) is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-operating cost and must-run power plants. It may be calculated:

- Based on the net electricity generation and a CO_2 emission factor of each power unit (Option A)

  Or

- Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (Option B)

Option A is the preferred choice according to the "Tool to calculate the emission factor for an electricity system", Version 03.0.0. In India, the Central Electricity Authority (CEA) has estimated the baseline emission for the power sector. This data has also been endorsed by NCDMA (DNA of India) and is the most authentic information available on the public domain. The CEA has compiled the CO2 emissions database, based on generation, fuel consumption and fuel calorific value data furnished by each power station. The simple OM emission factor has thus been calculated using option A1 i.e. based on fuel consumption and net electricity generation of each power plant/ unit. The details of the same can be found on CEA website at http://cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm.

According to option A, the simple OM emission factor is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:
$EF_{grid,OMsimple,y}$ = Simple operating 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 = All power units serving the grid in year y except low-cost / must-run power units
y = The relevant year as per the data vintage chosen in Step 3

Determination of $EF_{EL, m, y}$
As per the "Tool for calculating the emission factor of an electricity system", version 03.0.0, $EF_{EL, m,y}$ has been calculated as per the **option A1**.

If for a power unit *m* data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL, m, y}$) should be determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$

Where:
$EF_{EL,m,y}$= CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$FC_{i,m,y}$ = Amount of fossil fuel type *i*consumed by power 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)
$EF_{CO2,i,y}$ = CO2 emission factor of fossil fuel type *i*in year *y* (tCO_2/GJ)
$EG_{m,y}$= Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
m = All power units serving the grid in year *y* except low-cost/must-run power units
i = All fossil fuel types combusted in power unit *m* in year *y*
y = The relevant year as per the data vintage chosen in Step 3

Since Option 1 has been considered i.e. Only grid power plants were included in the calculation as per Step 2; according to the "Tool for calculating the emission factor for an electricity system" , version 03.0.0, $EG_{m, y}$ has been determined as per the provisions in the monitoring tables.

Since Ex-ante option has been selected for data vintage, the Simple OM emission factor ($EF_{grid,OMsimple,y}$)is taken for the most recent three years and an average value has been considered as the OM emission factor for the baseline ($EF_{grid, OM, y}$).

In India, the CEA (Central Electricity Authority) has estimated the baseline emission factor for the power sector. This data has also been endorsed by the NCDMA (DNA) and is the most authentic information available in the public domain. The details of same can be found on CEA website at http://cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm.

Operating Margin Estimation for Southern Grid (tCO2/ MWh)	
OM, 2008 – 09	0.9729
OM, 2009 – 10	0.9415
OM, 2010 – 11	0.9418
Average OM ($EF_{grid, OM, y}$)	**0.9514**

Step 5: Calculate the build margin (BM) emission factor

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:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

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

The emission factor ($EF_{EL,m,y}$)isdetermined as follows: Central Electricity Authority (CEA) has estimated the build margin emission factor $EF_{grid,BM,y}$ based on the most recent information available on the plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of the power plant capacity additions in the electricity system that comprise 20% of the system generation and that have been built most recently. In this case, the CEA data has been used as:

Build Margin Estimation for Southern Grid (tCO_2/ MWh)	
BM ($EF_{grid,BM,y}$), 2010 – 11	**0.7338**

With regard to data vintage, the project participant wishes to use Option 1 i.e. calculating 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 first crediting period. 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.

Step 6: Calculate the combined margin (CM) emission factor

As per the "Tool to calculate the emission factor for an electricity system", version 03.0.0, Weighted average CM method is used. The combined margin emissions factor is calculated as the weighted average of the Operating margin emission factor ($EF_{grid, OM, y}$) and the build emission factor ($EF_{grid, BM, y}$):

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM}$$

Where,
$EF_{grid,BM,y}$= Build margin CO_2 emission factor in year y (tCO_2/MWh) …….. Calculated in step 5 above
$EF_{grid,OM,y}$= Operating margin CO_2 emission factor in year y (tCO_2/MWh) …..Calculated in step 4 above
w_{OM}= Weighting of operating margin emissions factor (%)
w_{BM}= Weighting of build margin emissions factor (%)

Being a hydro power project, default values of the weights for operating and build margin are being used as $W_{OM} = W_{BM} = 0.5$

As aforesaid, Central Electricity Authority (CEA) has calculated the baseline emission factors for the regional grids in India according to the formulas specified above. As this is the most authentic information available in the public domain, the baseline emission factor used in the calculation of

baseline emissions for the proposed project activity is being referred from the latest version of the same[5].

Parameter	Unit	Net quantity of electricity generated (GWh)	Simple Operating Margin (tCO2/MWh) (incl. Imports)
2008-09 Data		127797.1945	0.9729
2009-10 Data		135773.9721	0.9415
2010-11 Data		145076.4566	0.9418
Operating Margin (OM) - 3 Year generation weighted average	tCO_2/MWh		0.9514
Build Margin (BM)	tCO_2/MWh		0.7338
Weight of OM (w_{OM})			0.5
Weight of BM (w_{BM})			0.5
Combined Margin (BEF)	tCO_2/MWh		**0.8426**

B.5. Demonstration of additionality

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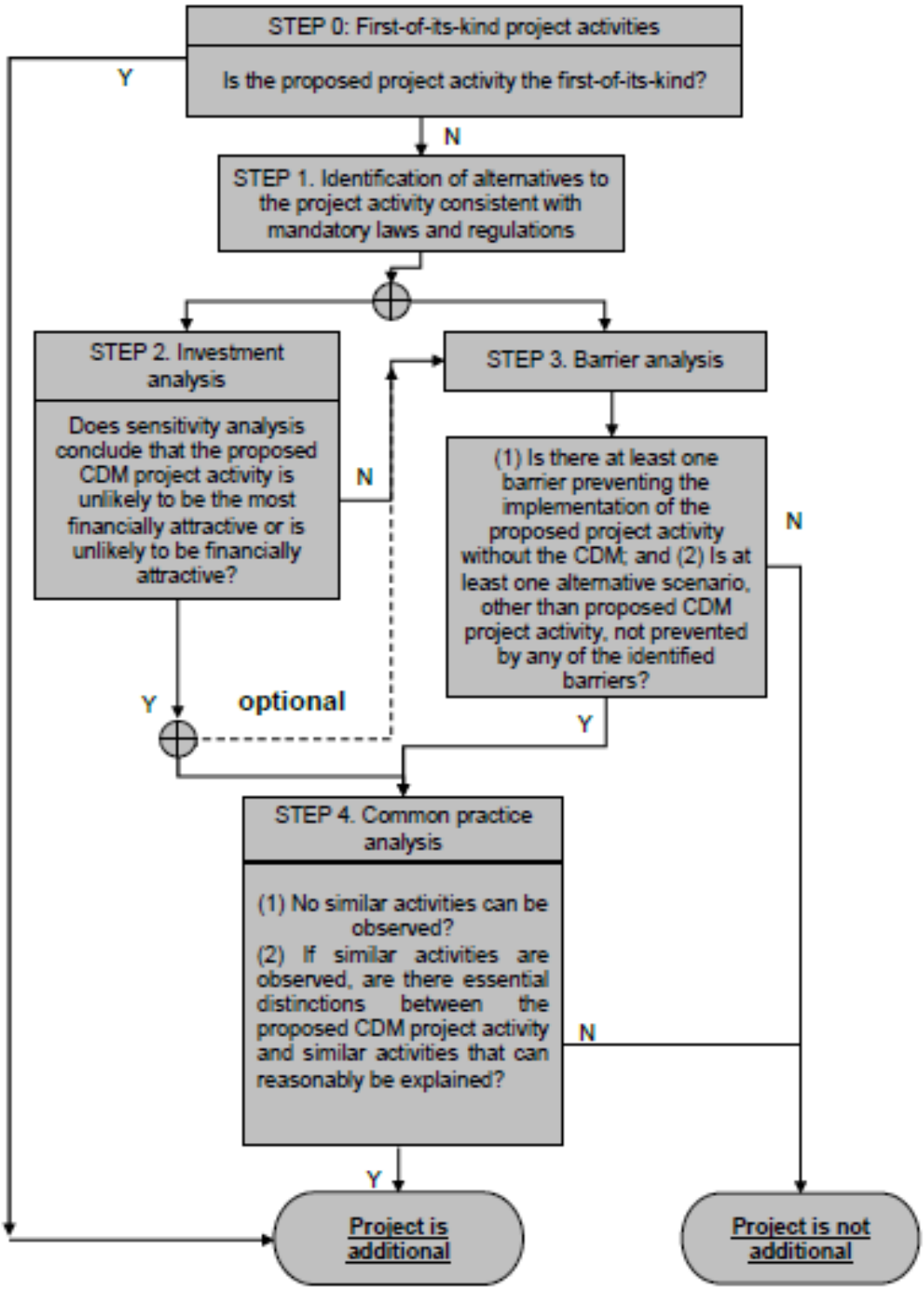
The project activity is said to be additional if the anthropogenic emissions of GHG by source are reduced below those that would have occurred in the absence of the registered CDM project activity. As per the applied methodology, "*the additionality of the project activity shall be demonstrated and assessed using the latest version of the Tool for the demonstration and assessment of additionality".*

The steps involved in demonstrating the additionality as per the latest version of the tool (Version 07.0 EB70) is as summarized below:

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

Figure 1 Flowchart of the step-wise approach



Step 0: Demonstration whether the proposed project activity is the first-of-its-kind:

The project is not a first of its kind activity. Therefore Step 1 will be applicable to the project activity.

Step 1: Identification of alternative scenarios

Step 1a: Define alternative scenarios to the proposed CDM project activity

Scenario 1 - The project activity not being taken forward as a CDM activity

The project proponent could have undertaken this hydro project, without it being a CDM project. However, it would have been financially unattractive. This is a possible alternative and hence is considered to be analysed further.

Scenario 2 – State electricity grid supplying equivalent amount of electricity
The southern grid would have supplied an equivalent amount of electricity to the region, in the absence of the project activity. This is a likely baseline scenario, since the region is already receiving electricity from the regional grid. Raichur district is supplied by GESCOM[6].

Outcome of Step 1a: List of plausible alternative scenarios to the project activity
After considering all the plausible alternatives to this project activity, it can be concluded that the identified alternatives will be:
- The continued supply of electricity from the regional grid (GESCOM in this case)
- The project activity not being undertaken as a CDM project.

Sub-step 1b: Consistency with mandatory applicable laws and regulations
Both the identified alternatives are in consistency with the mandatory applicable laws and regulations. As per the Electricity Act 2003, there is no restriction on the type of fuel to be used for electricity generation. Therefore, the two alternatives are in compliance with the local laws of the land. There is no mandate that enforces proponents to implement a hydro power project, therefore making the project activity a voluntary initiative.

Outcome of Step 1b: List of alternative scenarios to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

1. The continued supply of electricity from the regional grid (GESCOM in this case)
2. The project activity not being undertaken as a CDM project.

Step 2: Investment analysis

The objective of the Investment analysis step is to determine whether the proposed project activity is not:
(a) The most economically or financially attractive; or

(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

Sub Step 2 a: ***Determine appropriate analysis method***

Based on the additionalitly tool, three options have been provided to determine the appropriate analysis method.

Sub Step 2 b:

[6] http://www.gescom.in/aboutus/index.html

Option I: Apply Simple Cost analysis:
In addition to the CDM revenue, the project activity generates revenue from the sale of electricity to the grid. Therefore, Simple Cost analysis is not an appropriate analysis method.

Option II: Apply Investment Comparison analysis:
As per the Guidelines on the assessment of investment analysis[7], Version 05 EB62 guidance 19 states "*If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate".*

Option III: Apply benchmark analysis:
The baseline of the proposed activity (No project activity) does not require investment, i.e., the project proponent can chose to invest or not to. The PP does not have a mandate to invest in any project and therefore all investments of this nature would be a voluntary initiative for the PP. Also continuing of current scenario is the supply of electricity from a grid. Therefore, benchmark analysis is the appropriate method.

Sub Step 2 c: Calculation and comparison of financial indicators

The IRR is compared against an appropriate benchmark to decide on the project viability.
The equity Internal Rate of Return (Equity IRR) has been chosen as the financial indicator for the investment analysis. While computing the equity IRR, only the portion of investment costs which is financed by equity should be considered as the net cash outflow. This is in conformance with guidance 10 of the Guidelines on the assessment of investment analysis.

As per guidance 12 of Guidelines on the assessment of investment analysis, "*Required/expected returns on equity are appropriate benchmarks for an equity IRR"*. Therefore, the project proponent has chosen Cost of Equity as the benchmark to compare with the equity IRR.

As per guidance 15 of Guidelines on the assessment of investment analysis, *"……. the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices……".*

The project proponent has chosen option (a) to estimate the cost of equity. As per Appendix A of the Guidelines on assessment of investment analysis version 05, the project activity falls under Group 1 category of projects. The default value for the expected return on equity calculated after taxes is 11.75%. As per guidance 7 of Annex A, *project participants can convert the real term values provided in the table below to nominal values by adding the inflation rate. The inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period.*
Further,

In situations where an investment analysis is carried out in nominal terms, project participants can convert the real term values provided in the table below to nominal values by adding the inflation rate. The inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period. If this information is not available, the target inflation rate of the central bank shall be used. If this information is also not available, then the average forecasted inflation rate for the host country published by the IMF (International Monetary Fund World Economic Outlook) or the World Bank for the next five years after the start of the project activity shall be used.

Therefore,

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

As per IMF the WPI inflation rate is **5.185.**[8]

Therefore, the benchmark calculated based on the default value of RoE provided by UNFCCC for India will be

= (1+ Mean WPI Inflation) *(1+ Default RoE) -1

= (1 + 5.185) * (1+11.75%) – 1

= **17.54%**

The assumptions for the financial analysis are as follows –

Basic Assumptions for the project : (Technical)				
	Parameters	**Units**	**Values**	**Reference**
	Location			
	Project size	MW	24.75	DPR
	No. of Turbines		2	
	Capacity of each Turbine	MW	12.375	
	Total project cost	Million	**1453.9**	
Break-up for project cost				
	Preliminary works	Million	30	
	Land	Million	5	
	Power Plant Civil Works	Million	684.1	DPR
	Plantation	Million	0.2	
	Pre-operative	Million	12.0	
	Maintenance	Million	0.2	
	Special T&P	Million	1.5	
	Communication	Million	5.0	
	Electro Mechanical	Million	556.5	
	Hydro Mechanical	Million	38.0	
	Loss on Stock	Million	0.2	
	Interest during construction	Million	121.3.7	
	Total cost	Million	**1453.9**	

Energy Generation Data				
	Plant Load Factor	%	30.00%	DPR
	Net generation	kWh	65043000	Computed
	Net generation	MWh	65043	Computed
	Auxiliary Consumption including loss	%	976	
	Net generation (For Grid Export)	MWh	**64067**	Computed
Other Data				
	Life of the	Years	**35**[9]	CERC Order, 27/03/2012

[8] http://www.imf.org/external/pubs/ft/weo/2012/01/weodata/weorept.aspx?sy=2012&ey=2017&scsm=1&ssd=1&sort=country&ds=.&br=1&c=534&s=PCPIPCH&grp=0&a=&pr.x=70&pr.y=10

[9] As per CERC order dated 27/03/2012.

	Turbine			http://www.cercind.gov.in/2012/orders/RE_35_2012.pdf
	O & M Cost	Million INR	21.81	KERC Order - www.kerc.org/nce%20tariff%202009/Order%20on%20NCE%20Tariff%20final%20dt11.12.2009.doc
	Escalation in O & M charges	%	**3%**	
	Tariff	INR	3.4	KERC Order
Basic Assumptions for the project : (Financial)				
	Promoter's contribution	Million	431.8	DPR
	Term loan component	Million	1007.559	
	Total cost of the project	Million	**1439.4**	Calculated
	Rate of Interest on Term loan (P.A , payable quarterly)	%	**12.5%**	DPR
	Moratorium (years)	Years	1	DPR
	Repayment period (years)	Years	9	
	MNRE Subsidy	Million	59.5	MNRE
	Depreciation under Companies Act (Machinery)	%	5.28	Rates of depreciation under companies act - Schedule XIV http://taxguru.in/company-law/rates-of-depreciation-under-the-companies-act-as-mentioned-in-schedule-xiv.html
	Depreciation under Companies Act (Buildings and civil works)	%	3.34	
	Depreciation under IT Act (Machinery)	%	30	http://www.10toeverything.com/home/indian-income-tax/depreciation-as-per-income-tax-act-and-company-act-ay-fy-2012-13
	Depreciation under IT Act (Civil Works)	%	5	
	Income Tax Minimum Alternate Tax (MAT	% %	32.45 % 20.01	

The Equity IRR computation based on the above worked out to be 9.4% which is below the benchmark of 17.54%.

Considering the revenue accruing over sale of CERs, the equity IRR improves to 12.25%.

Sub Step 2 d: Sensitivity Analysis

A sensitivity analysis has been carried out to further strengthen the financial additionality for this project. As per guidance 20 of Guidelines on the assessment of investment analysis "*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".* The parameters therefore subjected to sensitivity analysis are:

- Project cost
- O&M cost
- PLF
- Power tariff

Parameters	Equity IRR	Benchmark
Base Case	**9.4%**	**17.54%**
10% Decrease in Electricity Generation	**6.80%**	
10% Increase in Electricity Generation	**12.15%**	
10% Decrease in O&M Cost	**9.68%**	
10% Increase in O&M Cost	**9.12%**	
10% Increase in Tariff	**12.15%**	
10% decrease in Tariff	**6.80%**	
10% Decrease in Project Cost	**12.55%**	
10% Increase in Project Cost	**6.94%**	

It can be noted that the IRR does not cross this benchmark even if the important techno-commercial parameters are modified:

As per the guidelines on the assessment of investment analysis version 05 EB 62 guidance no. 21, **"In cases where a scenario will result in the project activity passing the benchmark or becoming the most financially attractive alternative the DOE shall provide an assessment of the probability of the occurrence of this scenario in comparison to the likelihood of the assumptions in the presented investment analysis, taking into consideration correlations between the variables as well as the specific socio-economic and policy context of the project activity"**

From the above mentioned results of sensitivity analysis, it is evident that the equity IRR does not cross the benchmark within the chosen range. However, the sensitivity at which the equity IRR crosses the benchmark is provided below along with the justification of the probability of these scenarios not occurring.

PLF – With an increase in 28.5% in the PLF, the equity IRR crosses the benchmark. However, the probability of this is nil due to the following reasons:

- The PLF is considered as per the DPR. The DPR matches with the KERC Order which also considers a PLF of 30% for small-hydel projects. Since the PLF considered at 30% is as per the DPR and which has been worked out based on the average rainfall in the region over ten years. Therefore, it is unlikely that the PLF would increase up to 28.5%.

Power purchase tariff – With an increase in 28.5% in the tariff, the equity IRR crosses the benchmark. However, the probability of this is nil due to the following reasons:

- The KERC Tariff dated 11/12/2009 fixes the tariff of INR 3.4 per unit without any escalation for a period of 10 years for all small hydel power projects in Karnataka.

Project cost – With a decrease in 21.6% of the project cost, the equity IRR crosses the benchmark. The project cost has been estimated as of May 2012 and given that the construction activity/ PO placements have not been initiated it is only likely that the project cost would increase rather than decrease.

O&M cost – Even with no O&M costs, the IRR does not reach the benchmark. There is no likelihood of not having an O&M expense for a project activity.

Therefore, this analysis clearly projects that CDM revenue improves the financial viability of the project activity.

The other alternative, which is the continued supply of electricity (GESCOM), will not involve any form of investment since (since the alternative also indicates 'no project activity'). The location of the project activity (Raichur District) is well connected to the Southern regional grid.

Therefore, it is evident that the least cost option among the two alternatives will be the continued supply of electricity from the GESCOM grid supply. Further, the investment analysis strengthens the fact that alternative "project activity undertaken without CDM" is financially not a viable alternative.
As per Tool for assessment and demonstration of additionality version 07.0.0, the outcome of step 2 is as follows:

Outcome of step 2: From the sensitivity analysis it is concluded that, the project activity is not the most financially attractive option and therefore the common practice analysis follows next.

Step 4: Common Practice analysis:

The common practice analysis has been carried out on the basis of GUIDELINES ON COMMON PRACTICE (Version 02.0., EB 69, and Annexure 08)[10].

As per the guidelines, the following definitions have been mentioned. The table below gives the definitions as applicable in case of this particular project:

Definitions	Applicability for this project
Applicable geographical area	India
Measure	Since this is a hydro power project, it falls under "*Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies (example: energy efficiency improvements, power generation based on renewable energy)*"
Output	The project generates electricity.
Different technologies	The different technologies have been identified on the basis of: Energy source/fuel (example: energy generation by different energy sources such as wind and hydro and different types of fuels such as biomass and natural gas).

As per this guideline, the following steps have been given to carry out the common practice analysis.

Step 1: calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity

The project capacity is 24.75 MW
Thus the output range is 12.375 MW to 37.125 MW.

Step 2: identify similar projects (both CDM and non-CDM) which fulfill all of the following conditions:
(a) The projects are located in the applicable geographical area;
(b) The projects apply the same measure as the proposed project activity;

[10] http://cdm.unfccc.int/filestorage/x/f/TV4BDRH1QF2IJ07WG8XLNOMYUEZACK.pdf/eb69_repan08.pdf?t=Wm18bWNhM2lvfDDVxFVoQweQxGvCFTCiCGb_

(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;
(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;
(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity

The following table demonstrates the compliance of the project with the above conditions:

The projects are located in the applicable geographical area	India is the geographical area, hence all projects located in India has been selected. Hence this criterion is satisfied.
The projects apply the same measure as the proposed project activity	'Measure' indicated in this refers to Renewable based projects (as per the definition *Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies (example: energy efficiency improvements, power generation based on renewable energy*).
The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity	Since the project is a hydro power project, this criterion is not applicable. Hence this criteria is satisfied.
The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant	All the plants in which the projects are implemented to generate and supply electricity to the grid have been chosen. Hence this criteria is satisfied.
The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1	All the plants whose output range is between 12.375 to 37.125 MW have been selected. Hence this criterion is satisfied.
The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity	All the projects that have been selected had started commercial operation before the PDD got webhosted on 24 July 2012. Hence this criterion is satisfied.

The Electricity Act 2003 came into force in June 2003. The projects commissioned before the Electricity Act, 2003 have not been considered for common practice analysis. It should be noted that there was no uniform regulation for determination of tariff for generation & sale of power prior to the Electricity Act, 2003 and moreover, in India power sale tariff and power purchase agreements for all states are based upon the guidelines of this Act. Hence, all prospective project owners since 2003 have to include the effect of this Act (i.e., State-wise power sale tariff orders) during taking investment decision. This option was not available to project owners prior to 2003 and hence, in accordance to the approved methodological tool, projects installed after 2003 have a "similar regulatory frameworks and investment climate".

The number of projects under each fuel type within the applicable range in India is as follows:

Fuel Type	Number of project within the given range
Thermal	7[11]
Hydro	6[12]
Wind	37[13]
Solar	0[14]
Biomass	6[15]
Nuclear	0[16]
Tidal	0[17]
Geothermal	0[18]

Thermal Power Plants:

Sl.No	Project Proponent Name	Commissioning Date	Capacity	Sate	Type	Sector
1	Baramura	03-Aug-10	21	Tripura	Thermal	State
2	Rokhia	31-Mar-06	21	Tripura	Thermal	State
3	Rithala CCCP	04-Oct-10	35.75	Delhi	Thermal	Centre
4	Rithala CCCP	09-Dec-10	35.75	Delhi	Thermal	Centre
5	Valathur GT	01-Sep-08	33.7	Tamil Nadu	Thermal	State
6	Kuttalam GT	24-Mar-04	37	Tamil Nadu	Thermal	State
7	Valantharvi	15-Apr-06	14.8	Tamil Nadu	Thermal	State

Hydro Power Plants

Sl.No	Project Proponent Name	Commissioning Date	Capacity	State	Type	Sector
1	Kopili ST-II	31-Dec-03	25	Assam	Hydro	Centre
2	Madhikheda	28-Aug-06	20	Madhya Pradesh	Hydro	State

[11] The details regarding the thermal power plants in India have been taken from Baseline Carbon Dioxide Emission Database Version 7.0. The link for the same is as follows: http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

[12] The details regarding the hydro power plants in India have been taken from Baseline Carbon Dioxide Emission Database Version 7.0. The link for the same is as follows:http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

[13] The list of wind power projects have been taken from the "The Indian Wind power directory 2011", which is an official compendium of wind power projects in India.

[14] The list of solar projects has been selected from the Renewable Energy Corporation websites of each and every state in India.

[15] The list of biomass projects has been selected from the Renewable Energy Corporation website of each and every state of India. Many of the renewable energy corporation sites do not contain a proper list of biomass projects along with their installed capacities. Hence only those projects for which proper data is available have been considered. One of the projects by Birla Corporation Limited which has a capacity of 15 MW and located in Maharashtra, has not been considered since it is a captive power plant.

[16] As per Nuclear Power Corporation of India Limited website (http://www.npcil.nic.in/main/contactus_stations.aspx#rajasthan), there are no nuclear projects in India in the applicable range.

[17] As per Business Line, the first commercial tidal energy project is yet to be commissioned in India by Atlantis Resources Corporation. This will only be commissioned by 2013. The link for the same is as follows: http://www.business-standard.com/india/news/india-set-to-get-asia%5Cs-first-tidal-power-plant/421859/

[18] As per research conducted by Energy Alternatives India (a market research firm specializing in the domain of energy) there are no grid connected geo thermal power project in India. The link for the same is as follows: http://www.eai.in/ref/ae/geo/geo.html

3	Madhikheda	09-Sep-06	20	Madhya Pradesh	Hydro	State
4	Almatti Dam	26-Mar-04	15	Karnataka	Hydro	State
5	Bhawani Kattalai Barrage	01-Aug-06	15	Tamil Nadu	Hydro	State
6	Bhawani Kattalai Barrage	22-Sep-06	15	Tamil Nadu	Hydro	State

Biomass Power Plants:

Sl.No	Project Proponent Name	Capacity	State	Sector
1	IndBharath Energies[19]	20	Maharashtra	Private
2	RR Energy Limited[20]	15	Chattisgarh	Private
3	KVK Bio-Energy Pvt. Ltd.[21]	15	Chattisgarh	Private
4	Sambhav Energy Ltd.[22]	20	Rajasthan	Private
5	Godawari Power &Ispat Ltd.	20	Chattisgarh	Private
6	Gaps power & infrastructure pvt ltd	13	Maharashtra	Private

Wind Power Plants:

Sl.No	Project Proponent Name	Capacity	State	Sector
1	Accion Wind Energy Pvt Ltd	16.5	Karnataka	Private
2	Aryan Coal Benefication	15	Maharashtra	Private
3	Belgaum Wind Farms Pvt. Ltd	24.8	Karnataka	Private
4	Best & Co	25	Tamil Nadu	Private
5	CLP Windfarm (I) Pvt Ltd	20.8	Karnataka	Private
6	CPCL	17.6	Tamil Nadu	Private
7	DLF Home Developers	19.5	Rajasthan	Private
8	DLF Home Developers	33	Tamil Nadu	Private
9	Doodanava r& Brothers	15	Karnataka	Private
10	Enercon Wind Farms (Raj) Pvt Ltd	24	Rajasthan	Private
11	Enercon Wind farms Sai Limited	20	Maharashtra	Private
12	GACL	23.75	Gujarat	Private
13	Generacion Eolica India Pvt Ltd	31.2	Karnataka	Private
14	Green Infra Wind Farms Ltd	24	Tamil Nadu	Private
15	Gujarat Flourochemicals Limited	23.1	Maharashtra	Private
16	Gujarat Flourochemicals Limited	19.5	Rajasthan	Private
17	HPCL	21.25	Rajasthan	Private
18	Gujarat NRE Coke Limited	26.25	Gujarat	Private
19	HZL	18.4	Karnataka	Private
20	IOCL	21	Gujarat	Private

[19] http://www.mahaurja.com/PDF/Biomass_Proj_StatusC.pdf

[20] http://www.credacg.org/bpg_projects_commissioned.htm

[21] http://www.credacg.org/bpg_projects_commissioned.htm

[22] http://www.rrecl.com/PDF/Commissioned.pdf

21	Jaiprakash Associates	16.25	Maharashtra	Private
22	Jindal Steel and Power Limited	24	Maharashtra	Private
23	Kohinoor Planet Construction	24	Rajasthan	Private
24	KPR Mill	19.8	Tamil Nadu	Private
25	Modern Road Makers	20	Rajasthan	Private
26	MSPL Group	30	Gujarat	Private
27	Patnaik Minerals	35.2	Gujarat	Private
28	Patnaik Minerals	15	Maharashtra	Private
29	Madras Cement Limited	19.8		Private
30	Rajasthan Ren Energy Corp Limited	25	Rajasthan	State
31	Rajasthan State Mines and Minerals Limited	15	Rajasthan	State
32	Rajasthan State Mines and Minerals Limited	22.5	Rajasthan	State
33	Rajasthan State Mines and Minerals Limited	31.5	Rajasthan	State
34	Manganese Ore (India) Limited.	15.2	Madhya Pradesh	State
35	Powerica Limited	16.5	Tamil Nadu	Private
36	Soundararaja Mills	20	Tamil Nadu	Private
37	India Power Corporation Limited (IPCL)	24.8	Gujarat	Private

Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number Nall

From the list of private power plants mentioned in Step 2 the list of power plants which are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation is given below:

Thermal Project:

Sl.No	Project Proponent Name	Commissioning Date	Capacity	Sate	Type	Sector
1	Baramura	03-Aug-10	21	Tripura	Thermal	State
2	Rokhia	31-Mar-06	21	Tripura	Thermal	State
3	Rithala CCCP	04-Oct-10	35.75	Delhi	Thermal	Centre
4	Rithala CCCP	09-Dec-10	35.75	Delhi	Thermal	Centre
5	Valathur GT	01-Sep-08	33.7	Tamil Nadu	Thermal	State
6	Kuttalam GT	24-Mar-04	37	Tamil Nadu	Thermal	State
7	Valantharvi	15-Apr-06	14.8	Tamil Nadu	Thermal	State

Hydro Project:

Sl.No	Project Proponent Name	Commissioning Date	Capacity	State	Type	Sector
1	Kopili ST-II	31-Dec-03	25	Assam	Hydro	Centre
2	Madhikheda	28-Aug-06	20	Madhya Pradesh	Hydro	State
3	Madhikheda	09-Sep-06	20	Madhya Pradesh	Hydro	State
4	Almatti Dam	26-Mar-04	15	Karnataka	Hydr	State

					o	
5	Bhawani Kattalai Barrage	01-Aug-06	15	Tamil Nadu	Hydro	State
6	Bhawani Kattalai Barrage	22-Sep-06	15	Tamil Nadu	Hydro	State

Wind Power Plants:

Sl.No	Project Proponent Name	Capacity	State
1	Best & Co	25	Tamil Nadu
2	Soundararaja Mills	20	Tamil Nadu

The list of power plants that are under CDM and their CDM reference is provided in the below table.

List of Biomass Power Plants under CDM

Sl. No	Project Proponent Name	Capacity	State	CDM Status	CDM referenece
1	Ind Bharath Energies	20	Maharashtra	Yes	http://cdm.unfccc.int/Projects/DB/TUEV-SUED1256547738.62
2	RR Energy Limited	15	Chattisgarh	Yes	http://cdm.unfccc.int/Projects/DB/SGS-UKL1158161760.22/view
3	KVK Bio-Energy Pvt. Ltd.	15	Chattisgarh	Yes	http://cdm.unfccc.int/Projects/Validation/DB/R775FQ7UVYVVD0RO16Q0BN2DT5WH67/view.html
4	Sambhav Energy Ltd.	20	Rajasthan	Yes	http://cdm.unfccc.int/Projects/Validation/DB/778HZWKTDPISOU40RB2LQC1BZMDTWM/view.html
5	Godawari Power &Ispat Ltd	20	Chattisgarh	Yes	http://cdm.unfccc.int/Projects/Validation/DB/DAB3N3UF9L4HJLAXJBW7A1V8SFICWF/view.html
6	Gaps power & infrastructure Pvt ltd	13	Maharashtra	Yes	http://cdm.unfccc.int/Projects/DB/SGS-KL1171466457.73/view

List of Wind Power Plants under CDM:

Sl.No	Project Proponent Name	Capacity	State	CDM Status	Reference
1	Accion Wind Energy Pvt Ltd	16.5	Karnataka	Yes	http://cdm.unfccc.int/Projects/DB/DNV-CUK1216117082.43/view
2	Aryan Coal Benefication	15	Maharashtra	Yes	http://cdm.unfccc.int/Projects/Validation/DB/SB3OIAHMLZK0Z0KZ1J4ZLHHC8O8541/view.html
3	Belgaum Wind Farms Pvt. Ltd	24.8	Karnataka	Yes	http://cdm.unfccc.int/Projects/DB/DNV-CUK1204705646.68/view
4	CLP Windfarm (I) Pvt Ltd	20.8	Karnataka	Yes	http://cdm.unfccc.int/Projects/Validation/DB/UTY2YY69RTQ04NJW0ZRHKU5VSCZAGV/view.html
5	CPCL	17.6	Tamil Nadu	Yes	http://cdm.unfccc.int/Projects/DB/BVQI1257245548.54/view

Sl.No	Project Proponent Name	Capacity	State	CDM Status	Reference
6	DLF Home Developers	19.5	Rajasthan	Yes	http://cdm.unfccc.int/Projects/Validation/DB/34CAG54CUL49MILW9S0SKWCWU38SSX/view.html
7	DLF Home Developers	33	Tamil Nadu	Yes	http://cdm.unfccc.int/Projects/Validation/DB/34CAG54CUL49MILW9S0SKWCWU38SSX/view.html
8	Doodanavar& Brothers	15	Karnataka	Yes	http://cdm.unfccc.int/Projects/Validation/DB/41QELS82OAMKTCOUWKY4N0ZBYGHD7M/view.html
9	Enercon Wind Farms (Raj) Pvt Ltd	24	Rajasthan	Yes	http://cdm.unfccc.int/Projects/DB/SGSUKL1181738388.43/viewnfccc.int/Projects/DB/SGSUKL1181738388.43/viehttp://cdm.unfccc.int/Projects/DB/SGSUKL1181738388.43/vie
10	Enercon Wind farms Sai Limited	20	Maharashtra	Yes	http://cdm.unfccc.int/Projects/DB/DNV-CUK1279516994.31/view
11	GACL	23.75	Gujarat	Yes	http://cdm.unfccc.int/Projects/Validation/DB/PLJVAOHCZK3WX6GN4QGVAH8C3MGAYP/view.html
12	Generacion Eolica India Pvt Ltd	31.2	Karnataka	Yes	http://cdm.unfccc.int/Projects/DB/RWTUV1290591737.68/view
13	Green Infra Wind Farms Ltd	24	Tamil Nadu	Yes	http://cdm.unfccc.int/Projects/Validation/index.html
14	Gujarat Flourochemicals Limited	23.1	Maharashtra	Yes	http://cdm.unfccc.int/Projects/DB/RWTUV1202913883.06/view
15	Gujarat Flourochemicals Limited	19.5	Rajasthan	Yes	http://cdm.unfccc.int/Projects/Validation/DB/2PRTXEX2D3L8N6SMULG87OVB1WWJPG/view.html
16	HPCL	21.25	Rajasthan	Yes	http://cdm.unfccc.int/Projects/Validation/DB/H88VQDBMZDVSK37NPUUWXHR25K08FR/view.html
17	Gujarat NRE Coke Limited	26.25	Gujarat	Yes	http://cdm.unfccc.int/Projects/Validation/DB/2WHFROEPK85ARNQ1TVKJV4WC8ATMAB/view.html
18	HZL	18.4	Karnataka	Yes	http://cdm.unfccc.int/filestorage/N/9/L/N9L0SY7CEOBTXFVGZQP5UH218WI6AJ/PDD%20HZL%20KTN%20Clean.pdf?t=c0p8bTl1ZXptfDBxvJKc4KmJKltszHd7Mg0h
19	IOCL	21	Gujarat	Yes	http://cdm.unfccc.int/Projects/DB/DNV-CUK1304071464.49/view

Sl.No	Project Proponent Name	Capacity	State	CDM Status	Reference
20	Jaiprakash Associates	16.25	Maharashtra	Yes	http://cdm.unfccc.int/Projects/DB/SGS-UKL1266513892.49/view
21	Jindal Steel and Power Limited	24	Maharashtra	Yes	http://cdm.unfccc.int/Projects/DB/DNV-CUK1331028815.56/view
22	Kohinoor Planet Construction	24	Rajasthan	Yes	http://cdm.unfccc.int/Projects/DB/BVQI1302691944.71/view
23	KPR Mill	19.8	Tamil Nadu	Yes	http://cdm.unfccc.int/Projects/DB/SIRIM1299217620.46/view
24	Modern Road Makers	20	Rajasthan	Yes	http://cdm.unfccc.int/Projects/Validation/DB/AERX8YCUI2RBEAK41JC7IF8SN67G1P/view.html
25	MSPL Group	30	Gujarat	Yes	http://cdm.unfccc.int/Projects/DB/BVQI1286434210.07/view
26	Patnaik Minerals	35.2	Gujarat	Yes	http://cdm.unfccc.int/Projects/DB/RWTUV1288029478.94/view
27	Patnaik Minerals	15	Maharashtra	Yes	http://cdm.unfccc.int/Projects/DB/RWTUV1306214743.43/view
28	Madras Cement Limited	19.8		Yes	http://cdm.unfccc.int/Projects/Validation/DB/Q861X5CIWDLQSWCRTY3HP0MHMBDM7S/view.html
29	Rajasthan Ren Energy Corp Limited	25	Rajasthan	Yes	25 MW Grid Connected Wind Farm project by RRECL in Jaisalmer, India.
30	Rajasthan State Mines and Minerals Limited	15	Rajasthan	Yes	http://cdm.unfccc.int/Projects/DB/DNV-CUK1243661243.16/view
31	Rajasthan State Mines and Minerals Limited	22.5	Rajasthan	Yes	http://cdm.unfccc.int/Projects/DB/BVQI1201770524.09/view
32	Rajasthan State Mines and Minerals Limited	31.5	Rajasthan	Yes	http://cdm.unfccc.int/Projects/Validation/DB/RNNKAHLY2ZRXKKY7KS859PZOQL3XCJ/view.html
33	Manganese Ore (India) Limited.	15.2	Madhya Pradesh	Yes	http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1265262346.25/view
34	Powerica Limited	16.5	Tamil Nadu	Yes	http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1264590823.08/view
35	India Power Corporation Limited (IPCL)	24.8	Gujarat	Yes	http://cdm.unfccc.int/Projects/Validation/DB/K0ZTRSQUQH8WZN76AA11ZAZW16BPNH/view.html

All projects that are not registered under CDM or not under validation are considered for calculation of Nall. In this case all the thermal projects (7 nos), 6 hydro projects and 2 wind projects are not under CDM

Hence N_{all} = 15

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number Ndiff

Among all the power plants identified within N_{all}, the number of power plants that are not using Hydro as a technology is 9,

Based on the criteria of Investment Climate, the projects outside the state of Karnataka have been considered as Ndiff.

Under the Electricity Regulatory Act in 1998[23], the Central Electricity Regulatory Commission and the State Regulatory Commissions to be set up was indicated. Meaning that, every state would have a governing regulatory body and commission to regulate the power scenario of the respective state. Given that each state is different geographically with different terrains, they would also therefore require state specific subsidies and tariff. Therefore, under this Act and The Karnataka Electricity Reform Act[24], the Karnataka Electricity Regulatory Commission was set up. The Karnataka Electricity Regulatory Commission (KERC) is an independent, autonomous body constituted under the Karnataka Electricity Reforms Act, 1999. It was established in November 1999. The primary objective of KERC is to regulate the power sector in the state of Karnataka and also determine tariff, regulate electricity purchase, facilitate intra-transmission and wheeling charges. specify state grid code and so on. Therefore, any project being implemented in the state of Karnataka must comply and adhere to the norms as per the KERC.

Similarly, every state in India has their respective ERC and projects must comply to their respective ERC norms and obligations.

States	Capital Cost (Lakh/MW)	PLF	Tariff
Assam[25]	700 (<=5 MW) 630 (5-25 MW)	45%	INR 3.19/kWh
Madhya Pradesh	700 (Run of the River) 600 (Canal based generation)	35% for run of the river 30% for canal based generation	INR 5.4/kWh
Tamil Nadu[26]	550 (<= 5MW)	33.62%	INR 3.35/kWh
Karnataka	475 (Upto 25 MW)	30%	INR 3.4/kWh

This highlights the fact that every state ERC provides a different investment climate for each category of projects within a state, which governs the technical and economic feasibility of the project.
Therefore, all projects outside of Karnataka have a different tariff structure including subsidies and other benefits available. Therefore, all projects outside the state of Karnataka is considered as N_{diff}
Also, among the Hydro power projects, all of the projects which are not within the state of Karnataka will be considered for calculation of N_{diff} since each state has its own tariff orders and legal regulations.
Thus the Hydro power projects beyond the state of Karnataka are:

Sl.N	Project Proponent	Commissioning	Capacity	State

[23] http://www.powermin.nic.in/acts_notification/central_regulatory_preliminary.htm

[24] http://www.kerc.org/_web/_/_/_/_/_/aboutus.html

[25] http://ireda.gov.in/writereaddata/Manual/Assam/Assam_ERComssion_7_of_2007.pdf

[26] http://tnerc.tn.nic.in/Concept%20Paper/2010/Consultative%20Paper-Smal%20hydro%20CP%20FC.pdf

o	Name	Date		
1	Kopili ST-II	31-Dec-03	25	Assam
2	Madhikheda	28-Aug-06	20	Madhya Pradesh
3	Madhikheda	09-Sep-06	20	Madhya Pradesh
4	Bhawani Kattalai Barrage	01-Aug-06	15	Tamil Nadu
5	Bhawani Kattalai Barrage	22-Sep-06	15	Tamil Nadu

Thus based on different technologies and different legal regulation N_{diff}= 14

Step 5: calculate factor F=1-Ndiff/Nall representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity

F = 1-(14/15)
Thus F = 0.07
As per version 02 of the GUIDELINES ON COMMON PRACTICE, The proposed project activity is a "common practice" within a sector in the applicable geographical area if the factor F is greater than 0.2 and Nall-Ndiff is greater than 3.

As per the above calculations F = 0.07 which is less than 0.2 and N_{all} - N_{diff} =1 which is less than 3. Thus the project is not a common practice.

Serious CDM Consideration
Kare Power Resources Private Limited is venturing into the field of renewable power for the first time with the intent of generating clean and green power. The CDM benefits were considered for this project activity during the DPR preparation stage indicating that CDM is a critical factor for the financial viability of the project.CDM actions have been undertaken even before purchase orders have been placed.

The chronology of events mentioned below highlights the various steps taken up by PP to secure the CDM revenue:

CDM activity	Date
CDM Consideration (board minutes)	15 May 2012
Prior Consideration[27]	29 May 2012
Stakeholder Consultation	7 June 2012
Appointment of DOE	6 July 2012

From above table, it could be seen that the prior CDM consideration form has been submitted before start date (The first Letter of Intent toward civil works was placed on 2 January 2013) and hence the project activity conforms to the "Guidelines on the demonstration and assessment of prior consideration of the CDM" Annex 13 of EB 62.

As per the guidance, The Board decided that for project activities with a starting date on or after 2 August 2008, the project participant must inform a Host Party designated national authority (DNA)

[27] http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html?s=40

and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months of the project activity start date and shall contain the precise geographical location and a brief description of the proposed project activity, using the standardized form F-CDM-Prior Consideration
Therefore, the project activity clearly meets the UNFCCC requirement of prior CDM consideration, since the form was submitted to both UNFCCC as well as NCDMA six months before placing the PO. The purchase orders are yet to be placed.

To summarize, CDM is a mandatory requirement to take the project activity forward. Taking into consideration the financial analysis and the other barriers as detailed above, Kare Power Resources Private Limited had considered CDM while taking the project decision.

Hence from the above analysis it can be concluded that the project activity is additional and the financial viability and sustainable operation is improved with the benefits of CDM.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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Emission Reductions

The project activity reduces GHG emissions by displacing fossil fuel fired grid electricity generation with renewable energy based generation. The emission reduction ERy by the project activity during a given year y is the difference between baseline emissions (BEy) and project emissions (PEy) and Leakage. As per the consolidated methodology ACM0002 version 13.0.0 as follows:

$$ER_y = BE_y - PE_y$$

As per ACM0002 version 13.0.0, baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

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

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

Project activity emissions

According to the chosen baseline methodology ACM0002 Version 13.0.0, the project emissions are calculated as follows:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

Where
PE_y = Project emissions in year *y* (tCO_2e/yr)
$PE_{FF,y}$= Project emissions from fossil fuel consumption in year *y* (tCO_2/yr)

$PE_{GP,y}$= Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)
$PE_{HP,y}$= Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e/yr)
The emissions due to combustion of fossil fuels are calculated as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, Version 02 EB41[28]
. The formula to use in case of fossil fuel (diesel) usage at the plant site is provided below:

$$PE_{Diesel,j,y} = \sum_i FC_{Diesel,j,y} \circ COEF_{Diesel,y}$$

Where:
$PE_{Diesel,j,y}$= Are the CO_2 emissions from Diesel combustion in process j during the year *y* (tCO_2/yr);
$FC_{Diesel,j,y}$= Is the quantity of Diesel combusted in process *j* during the year *y* (mass or volume unit/yr)
$COEF_{Diesel,y}$= Is the CO_2 emission coefficient of Diesel in year *y* (tCO_2/mass or volume unit)

The CO_2 emission coefficient $COEF_{Diesel,y}$will be calculated based on net calorific value and CO_2 emission factor of Diesel, as mentioned in option B of "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", (version 02). The formula hence used is:

$COEF_{i,y} = NCV_{i.y} x\ EF_{CO2,i,y}$

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

For the ax-ante estimation, the project emissions from diesel generation are considered to be zero.

Emissions of non-condensable gases from the operation of geothermal power plants ($PE_{GP,y}$)

As the project activity is a run-off river hydro power plant, emissions of non-condensable gases from the operation of geothermal power plants is not applicable.
Hence $PE_{GP,y}$= 0

Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

As per the applied methodology, for hydro power project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, project proponents shall account for project emissions, estimated as follows:

(a) If the power density (PD) of power plant is greater than 10 W/m^2:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000}$$

Where:
$PE_{HP,y}$ = Project emissions from water reservoirs (tCO_2e/yr)
EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants in year *y* ($kgCO_2e/MWh$)
TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y*

[28] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

(MWh)

$PE_{HP,y}$= 0

The power density of the project activity was computed as follows –

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:
PD = Power density of the project activity (W/m2)
Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W)
Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero
A_{PJ} = Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m2)
A_{BL} = Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m2). For new reservoirs, this value is zero

	Value	Unit
Cap_{PJ}	24750000	W
Cap_{BL}	0	W
A_{BJ}	940000	m2
A_{BL}	0	m2
PD	**26.33**	W/m2

Hence $PE_{HP,y}$= 0

Leakage
As per the consolidated methodology ACM0002, version 13.0.0, No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emissions sources are neglected.

B.6.2. Data and parameters fixed ex ante

(Copy this table for each piece of data and parameter.)

Data/Parameter	$EF_{grid, OM, y}$
Unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor for Southern regional grid
Source of data	Central Electricity Authority, Ministry of Power
Value(s) applied	0.9514
Choice of data or Measurement methods and procedures	The data has been sourced from the Central Electricity Authority's (CEA) Carbon Dioxide baseline database (Version 7.0) and is fixed ex-ante. The link to the database is provided below: http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Purpose of data	Computing Baseline emissions
Additional comment	The Operating Margin Emission Factor has been fixed for the duration of the entire crediting period.

Data / Parameter	$EF_{grid, BM, y}$
Unit	tCO_2/MWh
Description	Build margin CO_2 emission factor for Southern regional grid
Source of data	Central Electricity Authority, Ministry of Power
Value(s) applied	0.7338
Choice of data or Measurement methods and procedures	The data has been sourced from the Central Electricity Authority's (CEA) Carbon Dioxide baseline database (Version 7.0) and is fixed ex-ante. The link to the database is provided below: http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Purpose of data	Computing Baseline emissions
Additional comment	The Build Margin Emission Factor has been fixed for the duration of the entire crediting period.

Data / Parameter	$EF_{grid, CM, y}$
Unit	tCO_2/MWh
Description	Combined margin CO2 emission factor for Southern regional grid
Source of data	Central Electricity Authority, Ministry of Power
Value(s) applied	0.8426
Choice of data or Measurement methods and procedures	The data has been sourced from the Central Electricity Authority's (CEA) Carbon Dioxide baseline database (Version 7.0) and is fixed ex-ante. The link to the database is provided below: http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Purpose of data	Computing Baseline emissions
Additional comment	The Build Margin Emission Factor has been fixed for the duration of the entire crediting period.

Data / Parameter	$EF_{CO2, Diesel, y}$
Unit	tCO_2/GJ
Description	CO_2 emission factor of Diesel used in year *y* (tCO_2/GJ)
Source of data	As per the latest version 02 of "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", options a,b& c are not available to the PP. Thus option d i.e. IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories has been chosen and is fixed Ex-ante.
Value(s) applied	74.1
Choice of data or Measurement methods and procedures	IPCC default values
Purpose of data	Computing project emissions
Additional comment	The emission factor for diesel has been fixed for the duration of the entire crediting period.

Data / Parameter	$NCV_{Diesel, y}$
Unit	GJ/ tone
Description	Net calorific value of the Diesel in year y
Source of data	As per the latest version 02 of "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", options a,b& c are not available to the PP. Thus, the project proponent chooses option d i.e. IPCC default values at the upper 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 and is fixed Ex-ante.
Value(s) applied	43.0
Choice of data or Measurement methods and procedures	IPCC default values
Purpose of data	Computing project emissions
Additional comment	The net calorific value for diesel has been fixed for the duration of the entire crediting period.

B.6.3. Ex ante calculation of emission reductions

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The emission reduction ERy by the project activity during a given year y is the difference between baseline emissions (BE_y) and project emissions (PE_y) as per the consolidated methodology ACM0002 version 13 as follows:

$$ER_y = BE_y - PE_y$$

Where:
ER_y: Emission Reductions in year y (tCO_2e/yr)
BE_y: Baseline Emissions in year y (tCO_2/ yr)
PE_y: Project Emissions in year y (tCO_2/ yr)

Project activity emissions (PE_y)
Since the project activity is a run of river hydro power plant and doesn't result in new reservoirs or increase of existing reservoirs. Further, for the ex-ante estimation, the project emissions (CO_2) from diesel consumption and project import are also considered to be zero.
Hence **$PE_y = 0$**

So, **$ER_y = BE_y$**

As per ACM0002 version 13, baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

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

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
EG_y	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

As per Step 6 of the section B.6.1, **$EF_{grid,CM,y}$**has been calculated as **0.8426**

The annualelectricity displaced by the project activity (EG_y) has been calculated based on the study conducted by a 3rd party engineering company "TATA Consulting Engineers Limited" contracted by KPRPL (thus complying with EB 48, Annex 11) is **64067 MWh per annum**.

Hence, **BEy = 64067 (MWh) * 0.8426 (tCO_2/ MWh) = 53983 tCO_2**

Since, **$ER_y = BE_y$**
So, Emission reductions (**ER_y**) from 2013 – 14 onwards = **53983 tCO_2**

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)
2013-14	**53,983**	**0**	**0**	**53,983**
2014-15	**53,983**	**0**	**0**	**53,983**
2015-16	**53,983**	**0**	**0**	**53,983**
2016-17	**53,983**	**0**	**0**	**53,983**
2017-18	**53,983**	**0**	**0**	**53,983**
2018-19	**53,983**	**0**	**0**	**53,983**
2019-20	**53,983**	**0**	**0**	**53,983**
2020-21	**53,983**	**0**	**0**	**53,983**
2021-22	**53,983**	**0**	**0**	**53,983**
2022-23	**53,983**	**0**	**0**	**53,983**

Total	**539830**	**0**	**0**	**539830**
Total number of crediting years	10 years			
Annual average over the crediting period	**53,983**	**0**	**0**	**53,983**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter	$EG_{pj,y}$
Unit	MWh
Description	Net Electricity exported by project activity to the southern grid
Source of data	Form B (KPTCL)
Value(s) applied	64067 kWh (2013- 14 onwards)
Measurement methods and procedures	Measurement: NA Data Type: Calculated Monitoring frequency: Monthly Archiving Policy: Paper / Electronic Calculated as the difference between export and import EGpj,y = EGexport - EGimport
Monitoring frequency	Frequency of recording: Monthly
QA/QC procedures	Since this is a calculated value the QA/QC procedures will be applicable to export and import data
Purpose of data	Computation of baseline emissions
Additional comment	The data will be archived for the crediting period plus two years.

Data / Parameter	EG_{export}
Unit	MWh
Description	Electricity exported by project activity to the southern grid
Source of data	Form B (KPTCL)
Value(s) applied	64067 kWh
Measurement methods and procedures	Measurement: Energy meter (electronic trivector meter – main meter and check meter) Data Type: Measured Monitoring frequency: Continuous Monitoring recording: Monthly Archiving Policy: Paper / Electronic Location: KPTCL Sub Station
Monitoring frequency	Frequency of Monitoring : Continuous Frequency of measurement: Continuous Frequency of recording: Monthly
QA/QC procedures	The energy meter would be calibrated annually. The accuracy of the meter would be 0.2s. The data will be cross-checked with the tariff invoices submitted to Karnataka Power Transmission Corporation Limited for the electricity supplied to the grid. The primary monitoring is done through a main meter and check meter which is located at the KPTCL Substation. Only in case of the main meter not being functional, the secondary monitoring will provide a backup (fail-safe measure) which is done through Check meters.
Purpose of data	Computation of baseline emissions
Additional comment	The data will be archived for the crediting period plus two years.

Data / Parameter	EG_{import}
Unit	MWh
Description	Electricity imported by project activity from the southern grid
Source of data	Form B (KPTCL)
Value(s) applied	0
Measurement methods and procedures	Measurement: Energy meter (main meter and check meter) Data Type: Measured Monitoring frequency: Continuous Archiving Policy: Paper / Electronic Location: KPTCL Sub Station
Monitoring frequency	Frequency of Monitoring : Continuous Frequency of measurement: Continuous Frequency of recording: Monthly
QA/QC procedures	The energy meter would be calibrated annually. The accuracy of the meter would be 0.2s. The data will be cross-checked with the tariff invoices submitted to Karnataka Power Transmission Corporation Limited for the electricity supplied to the grid.Only in case of the main meter not being functional, the secondary monitoring will provide a backup (fail-safe measure) which is done through Check meters.
Purpose of data	Computation of baseline emissions
Additional comment	The data will be archived for the crediting period plus two years.

Data / Parameter	$FC_{Diesel,j,y}$
Unit	Liters or m^3/year
Description	Quantity of Diesel combusted in process *j* during the year *y*
Source of data	KPRPL records
Value(s) applied	0
Measurement methods and procedures	Measurement: Ruler gauge of accuracy class of 1% Data Type: Measured Monitoring frequency: As and when diesel is consumed at the site Archiving Policy: Paper
Monitoring frequency	When in use
QA/QC procedures	The opening and closing stocks of diesel at the plant would be cross-verified with the diesel purchase receipts provided by the supplier.
Purpose of data	Computation of project emissions
Additional comment	The DG set would be used if KPRPL is not able to import electricity from the grid. As the expected use of diesel is very low, for ex ante calculations, diesel consumption has been assumed to be zero.

B.7.2. Sampling plan

>>

Data and parameter monitored in section B.7.1 above does not require sampling.

The detailed monitoring plan has been included in Appendix 5 of the PDD.

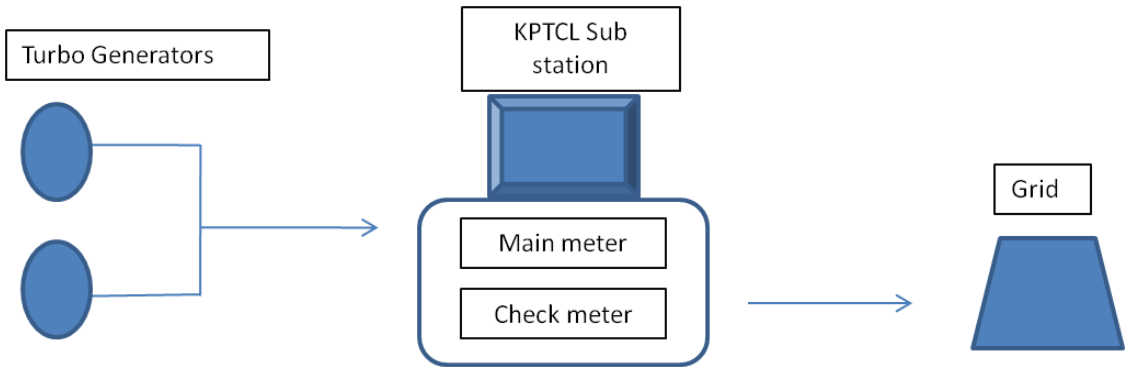
B.7.3. Other elements of monitoring plan

>>

This monitoring plan is developed in accordance with the methodology and is proposed to be used for grid-connected small hydroelectric project being implemented in Karnataka State, India. The monitoring plan is formulated as per the Monitoring methodology specified in the approved consolidated monitoring methodology ACM 0002, version 13.0.0.

The following parameters will be monitored:

1) Net electricity supplied by project activity to the southern grid EG_y
2) Electricity Exported by the project activity to the southern grid EG_{export}
3) Electricity imported by the project activity from southern grid EG_{import}
4) Quantity of diesel combusted during the process *j* during the year *y* $FCDiesel_{j,y}$



There is one set of main and check meter at the KPTCL sub station. The joint meter readings of the generation will be recorded by KPTCL personnel jointly with Kare personnel at the KPTCL sub-station. The JMR in the presence of KPTCL and Kare personnel will be recorded which will form the basis for the invoices.

Since the simple OM emission factor is calculated $_e$*x-ante* based on a 3 year average of the most recent statistics available at the time of PDD preparation, its updation based on ex post monitoring is not required. For BM Calculation, option 1 (refer “Tool to calculate the emission factor for an electricity system”, Version 03.0.0) has been chosen, which is calculated *ex ante* based on the most recent information, hence its monitoring is also not required.

KPRPL would be formulating a CDM project team, comprising of Shift Operator, Shift-in-charge and Project Manager at the plant site to ensure proper and regular monitoring of the parameters related to emission reduction calculations.

The Power plant In-charge employed at the plant site will be experienced in operating hydro power projects and would be responsible for operation and maintenance of the project activity. The

Electrical and Mechanical engineers recruited at the site would be responsible for the maintenance of the Electrical and Mechanical Department and would be reporting to the plant in-charge.

KPRPL would also constitute an *Internal Audit* team. The power plant in-charge would lead the team. The internal auditors would verify the data monitoring and recording system, KPRPL's preparedness for possible emergencies that may arise, KPRPL's data archiving system, recording of breakdown, recommend suitable actions as corrective measures and monitor actions taken against suggested recommendations during previous audits.

Emergency Preparedness Plan

The operational staff's main task is to keep a close watch on a day to day basis on the functioning of the major equipment. The operating staff would also document the downtime and operating hours for each turbine along with the reasons for the downtime. The operating staff would summarize the logbook data on a monthly basis and provide the same to the head office.

KPRPL will also deploy maintenance staff at the plant to ensure minimal breakdown of the major equipment. Additionally, it will ensure supply of sufficient quantity of critical and essential spares and consumables for the requirement of the machines. These critical and essential spares and consumables shall be stocked at the project site to reduce the machine repair downtime. A complete set of tools and tackles will be maintained at the project site. The site in-charge together with the staff would ensure that periodic maintenance checks are performed on all major components.

Detailed description is given in Appendix 5 of this PDD.

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

>>

Date of completion of methodology: 21/06/2016
Responsible Entity: Kare Power Resources Private Limited. (KPRPL)
Contact details: Refer Appendix 1

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>

The Letter of Intent for civil works was placed on 2 January 2013.

C.1.2. Expected operational lifetime of project activity

>>

35[29] years

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>

[29] As per CERC Order dated 27/03/2012.

The project activity shall use 10 years of fixed crediting period.

C.2.2. Start date of crediting period

>>
01/04/2015

C.2.3. Length of crediting period

10 years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
As per the prevailing host party laws, (the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated September 14, 2006), (http://envfor.nic.in/legis/eia/so1533.pdf), Environmental Impact Assessment study is not required for small scale (< 25 MW) hydro-electric power.

The following section summarizes the envisaged impact on environment due the project and various measures proposed by the project proponent to mitigate the same, both during construction and operational phase of the project.

Impact due to project location

The proposed scheme envisages the construction of various components like diversion weir, power canal, power house, tailrace channel and outdoor switchyard as its main components. The project involves no displacement of people and hence, no rehabilitation and resettlement problems would arise. The project does not result in any loss of any natural reserves, wildlife habitat or corridor and endangered species of wildlife/ trees.

Furthermore, the study revealed that no rubble quarries and mining/ minerals are situated in and around the proposed Hydro power project area and within 10 kms radius. There is no evidence of any archaeological monuments, sculpture, historical places etc. in the proposed project implementation are and within 10 kms radius of the project site. A No Objection Certificate (NOC) has also been obtained by the developer from the State Irrigation Department and the concerned land owners/ Gram Panchayats.

Impact during Construction and Operation Phase

Impact on air

During the construction phase, activities like excavation, dumping, concreting, vehicular traffic, blasting etc. would lead to impacts on air quality. But the impacts on air are expected to be minor negative factors which shall be temporary and localized. Provisions have been made for daily water spraying for dust suppression and checking of all vehicles for emissions. During the operation phase of the project, there shall be no impact on air and to prevent the impact due to occasional vehicular movements, green belt development around the project area has been envisaged along with usage of good quality fuels.

Impact on water

Construction activities leading to erosion due to excavation and dumps of muck can lead to increase in suspended solids for the surface water. The impacts shall be minor and preventive measures like usage of high pressure water hoses for cleaning and dust suppression, building of check dams and dykes to control soil erosion etc. shall be done to mitigate impacts if any. Appropriate sanitation facilities will be provided for the workers to reduce impact on source water

and ground water quality. Discharge of construction wastes into water bodies shall be strictly prohibited. Water treatment plant will be installed to supply clean drinking water o reuse waste water generated from the construction activity. Oily waste during the operation of the plant shall be collected separately and disposed off scientifically as per KSPCB norms.

Impact due to noise

During the construction and operation of the project, the related activities are expected to produce noise. The sources of continuous noise generating equipment such as turbines, DG sets and dewater pumps etc. will be designed to have noise level ranging between 40 – 75dB(A) at 1m of distance from the project location. Advanced silencers, acoustic barriers and vibration reducing pads will be provided for all these equipments. A two door entry system will be provided in the turbine room to control noise. Four line greenery belt in the form of native plants with good crown shall be erected to act as a buffer to the surrounding of powerhouse. All personnel working close to the noise generating equipment will be provided with adequate personal protective equipment such as earplugs and earmuffs.

Impact on Flora and Fauna

The proposed project components such as weir, power canal, power house and approach road etc. will be on Govt. Barren land. Entire width of the river course consists of thorn and bushy scrub vegetation. Hence, during the construction period no loss of commercial or medicinal plants would occur. For ecological management, the outer side of the existing hillocks/ mounds will be planted with Agave, Euphorbia species and the inner sides with Bamboo in close distance. Muck etc. during construction phase would be stored away from the river course to prevent any damage to the aquatic wildlife. During operation phase, mesh of appropriate size will be provided at the inlet points of the intake canal to prevent entry of fish into the water to the turbine. Hence, no harm on the ecological environment is envisaged.

Socio-Economic Impacts

The project activity shall have a positive impact on the socio-economic dynamics of the region. Local people from the study area shall be hired to the maximum extent possible. Proper facilities for domestic water supply, sanitation, domestic fuel and other essential community services will be made available to the construction workers. Larvicidal control measures will be carried out to reduce mosquitoes etc. During the operation phase, proper housing, civic amenities and infrastructure facilities will be provided to take care of the needs of the project employees and their families. Medical facilities would be provided from the nearest town. Operation personnel will be properly trained to facilitate and carry out maintenance and operation in an efficient manner. Fire fighting systems as per ISO 3034:1993 guidelines will be provided. Proper earthing to the equipments shall be provided. The project would lead to development of new road infrastructure and up gradation of existing roads. This shall be followed by development of educational infrastructure in the region by the project proponent.

Thus the project doesn't have any major adverse impacts on environment during its construction and operational phase. The project has already been granted "Consent to establish" by the Karnataka State Pollution Control Board. The magnitude of impacts during the project construction and operational phases is minimal and temporary.

D.2. Environmental impact assessment

>>

There are no significant environmental impacts envisaged due to the project activity

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

A stakeholder consultation process was conducted at Lingasagur (site office of KPRPL on 7 June 2012 at 11 am.

Prior intimation was provided to relevant stakeholders such as local community (villagers near the project site), Pollution Control Board, Electricity Board, Local Bank, Employees and so on through mail / courier invitations and by invitation through phone calls. Employees of Kare Power Resources Private Limited went to the village and personally invited them.

On the day of the consultation process, local conveyance was arranged for villagers and they were brought to the venue.

The discussion began with an introduction to the project activity by employees of KPRPL. Following which the global warming phenomenon and GHGs were explained to the audience. The need for renewable energy project was discussed. The discussion was then open for interaction.

Feedback was also captured and documented in the feedback forms circulated post the discussion.

E.2. Summary of comments received

>>
The following clarifications were raised by the audience.

1. If the project activity would cause flooding

Response – the project activity does not use a dam and only a weir will be constructed, therefore there is no risk of flooding

2. Whether blasting during construction would cause damage to their lands and homes

Response – the blasting would be taking place further away from their lands / homes and it would be controlled. Therefore, there would be no impact on the villagers

3. Whether the approach road to the river will be blocked due to the project activity

Response – the PP will take measures to ensure that this road is not blocked and will make alternative arrangements to have access to the river, in case the current approach road has to be blocked.

4. The approach to cattle grazing areas should not be blocked

Response – the PP will make arrangements for accessing the grazing land, by making access roads.

5. Whether employment opportunities will be provided to local villagers

Response – The PP indicated that some of the villagers have already been provided with employment opportunities for the initial construction work. Further, depending on the skill sets available, appropriate employment opportunities will be provided.

The responses as indicated above were also provided to the audience during the consultation process. Some of the stakeholders who were unable to attend the stakeholder process, have provided their opinion / feedback and the same has been documented in the feedback forms.

E.3. Report on consideration of comments received

>>
The stakeholder's comments have been considered while preparing the PDD. No negative comments were received from any of the stakeholders which mandated an action on the part of the project promoters.

SECTION F. Approval and authorization

>>

The Host Country approval (HCA) is not available at the time of submitting this PDD to the validating DOE.

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	Kare Power Resources Private Limited. (KPRPL)
Street/P.O. Box	No.20, Vittal Mallya Road
Building	No,103, Eden Park
City	Bangalore
State/Region	Karnataka
Postcode	560001
Country	India
Telephone	+91- 80-41127822
Fax	+91- 80- 40911046
E-mail	rg@karepower.com
Website	www.karepower.com
Contact person	Mr Raghuraj Gujjar
Title	Director
Salutation	Mr
Last name	Gujjar
Middle name	
First name	Raghuraj
Department	
Mobile	91-9845034446
Direct fax	-
Direct tel.	-
Personal e-mail	rg@karepower.com

Appendix 2. Affirmation regarding public funding

NO PUBLIC FUNDING AVAILABLE FOR THIS PROJECT ACTIVITY

Appendix 3. Applicability of methodology and standardized baseline

None

Appendix 4. Further background information on ex ante calculation of emission reductions

As already mentioned in Section B.6, the latest data from Central Electricity Authority (CEA) shall be used for calculating the build margin (BM) and operating margin (OM) emission factors. These values shall, in turn, be used to arrive at the baseline emission factor, according to ACM0002. The emission factor values from the CEA database are produced below:

CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE DATABASE

VERSION	**7.0**
DATE	**Jan-12**
BASELINE METHODOLOGY	**ACM0002 / Ver 12.2.0 and "Tool to Calculate the Emission Factor for an Electricity System", Version 2.2.1**

Simple Operating Margin (tCO2/MWh) (incl. Imports) (1) (2)

	2006-07	2007-08	2008-09	2009-10	2010-11
NEWNE	1.01	1.00	1.01	0.98	0.97
South	1.00	0.99	0.97	0.94	0.94
India	1.01	1.00	1.00	0.97	0.96

Build Margin (tCO2/MWh) (not adjusted for imports)

	2006-07	2007-08	2008-09	2009-10	2010-11
NEWNE	0.63	0.60	0.68	0.81	0.86
South	0.70	0.71	0.82	0.76	0.73
India	0.65	0.63	0.71	0.80	0.83

Net Generation in Operating Margin (GWh)

	2006-07	2007-08	2008-09	2009-10	2010-11
NEWNE	379,471	401,642	421,803	458,043	476,987
South	109,116	114,634	121,471	134,717	137,387
India	488,587	516,275	543,274	592,760	614,374

Year 2008-2009

From / To	Combined	Southern	Bhutan	Nepal
Combined		6,325.9	-5,897.1	90.0
Southern	-6,325.9		0.0	0.0
Bhutan	5,897.1	0.0		0.0
Nepal	-90.0	0.0	0.0	
Net imports	-518.8	6,325.9	-5,897.1	90.0
Total Imports	5,897.1	6,325.9	0.0	90.0

Year 2009-2010

From / To	Combined	Southern	Bhutan	Nepal
Combined		1,057.1	-5,341.1	0.0
Southern	-1,057.1		0.0	0.0
Bhutan	5,341.1	0.0		0.0
Nepal	0.0	0.0	0.0	
Net imports	4,284.0	1,057.1	-5,341.1	0.0
Total Imports	5,341.1	1,057.1	0.0	0.0

Year 2010-2011

From / To	Combined	Southern	Bhutan	Nepal
Combined		7,689.2	-5,610.0	0.0

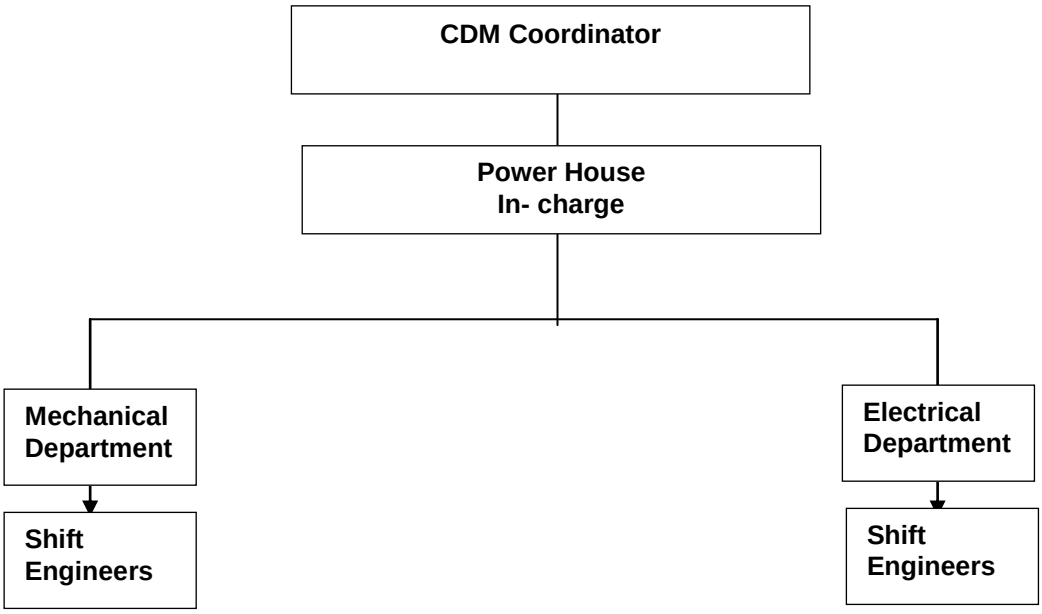
Southern	-7,689.2		0.0	0.0
Bhutan	5,610.0	0.0		0.0
Nepal	0.0	0.0	0.0	
Net imports	-2,079.2	7,689.2	-5,610.0	0.0
Total Imports	5,610.0	7,689.2	0.0	0.0

Appendix 5. Further background information on monitoring plan

The monitoring plan has been prepared in accordance with the methodology. The project proponent has a well defined project management structure for monitoring the project activity. The monitoring plan is discussed in section B7.2.
The monitoring methodology will essentially aim at measuring and recording through devices, which will enable verification of the emission reductions achieved by the project activity that qualifies as Certified Emission Reductions (CERs). The monitoring procedure for the project activity is given as follows:

Objective of Monitoring Procedure:
This procedure will set guidelines for the project proponent to monitor the parameters regularly and to ensure quality and accuracy in monitoring. It elaborates on the functions of the Monitoring team and procedures to be followed in monitoring of the CDM parameters.

CDM Team
The CDM team comprises of personnel from the various departments at the plant. Operators from the mechanical and electrical divisions in the plant will report to respective (shift engineers) who in turn will report to the Plant Manager. The Plant Manager will provide necessary inputs to the CDM Co-ordinator. The team is headed by GM (Projects). The organization structure of the CDM Team is given below.



Data Monitoring:
In order to ensure delivery of CERs, relevant data identified will be monitored

Data to be Monitored

1. Electricity exported by project activity to the southern grid, EG_{export} Recorded Monthly
2. Electricity imported by project activity from the southern grid, EG_{import}. Recorded Monthly
3. Quantity of Diesel combusted in process *j* during the year *y* $\mathbf{FC_{Diesel,j,y}}$ Recorded when in use.

List of Monitoring Equipments

1. Check Meters located at KPTCL sub station
2. Main Meters located at KPTCL sub station
3. Tube Gauge Indicators located at the project site

Frequency of Monitoring and Recording

1. Electricity Exported to grid: Monthly. Meter readings will be recorded by KPTCL and Kare personnel in the KPTCL sub station on a monthly basis.
2. Electricity Imported from the grid: Monthly. Meter readings will be recorded by KPTCL and Kare personnel in the KPTCL sub station on a monthly basis.
3. Diesel Oil Consumption: Tube Gauge Indicator. When in use. Log books will be maintained to record quantity consumed. The daily report will be aggregated to arrive at monthly production and monthly report will be generated

The net electricity generated is a calculated value obtained by taking the difference in export and import values. The export and import values can be cross checked with the invoices raised to KPTCL.

The Joint Meter Readings will be taken once a month in the presence of KPTCL and Kare personnel. This data will be used to raise an invoice to KPTCL.

Data Archiving

Log sheets and the other records archiving will be done for crediting period plus two years

Review Procedures & Frequency

Plant Manager will review the implementation of documented procedures and maintain necessary records. CDM Co-ordinator will review the procedures once a month for the first one year and once in three months thereafter. GM (Projects) will review once in six months.

Calibration Frequency

Periodic calibration schedule which spreads over the year for all electrical, electronic and field instruments are prepared and maintained. As per the schedule, calibration of instruments and equipments will be carried out annually and recorded in calibration reports.

Quality Assurance:

All energy meters used would be electronic trivector meters of accuracy class 0.2%. Annual testing of all energy meters shall be carried out, with reference to a portable meter, for checking the accuracy, which shall be of accuracy class 0.1 %.

Check meters readings will be used, in case main meters fail. In case both main and check/backup meters are found to be beyond permissible limit or error, both the meters will be calibrated immediately and the correction applicable to main meter will be applied to the energy registered by the main meter at the correct energy for the purpose of energy account/billing for the actual period during which inaccurate measurement were made.

Emergency Preparedness

No emergency situations, which can lead to unintended GHG emissions, are envisaged since there are no fuels involved in this project activity.

Uncertainties Related To GHG Emissions

No uncertainties are envisaged / foreseen relating to GHG emission.

Training of Personnel
Employees will be trained in-house by Kare. Apart from this training, various member of the CDM team will be trained time to time according to the departmental needs.

Appendix 6. Summary of post registration changes

The project applies following post registration changes:

Change in the project design:

There are some minor changes in the technical specification of power plant & equipments which are listed below:

- Rated head of the turbine is changed from 22 m to 25 m
- Rated flow rate of the turbine is changed form 67 m^3/s to 65 m^3/s
- Scouring Sluice Size is changed from '2.5m X 4.0 m (2 Nos)' to '1.2 m x 1.2 m (4 nos)
- Base width of power canal is changed from 15m to 16m

The technical specification in the registered PDD is based on the specification mentioned in the DPR. However, during the construction, these minor changes occurred to the project design. However, there is no change in the rated output capacity of the turbine. Moreover the changes do not make impact on the following:

(a) The applicability and application of the applied methodology under which the project has been registered;
(b) Compliance of the monitoring plan with the applied methodology;
(c) The level of accuracy and completeness in the monitoring of the project activity;
(d) The additionality of the project activity;
(e) The scale of the project activity;

Change in start date of the crediting period:

The start date of the crediting period is changed from 01/04/2013 to 01/04/2015. The change is proposed due to the delay in project implementation. At the time of validation of the project activity, it was expected that the project activity will be commissioned on July 2013. However, there was a delay in supply of project equipments. Due to this delay, the project was commissioned only on 16/09/2015. Hence, the project proponent wants to change the start date of the crediting period from 01/04/2013 to 01/04/2015.

Though the commissioning of the project got delayed, there is no other changes have occurred to the project activity that would result in a less conservative baseline and that substantive progress has been made by the project participants to start the project activity. The grid emission factor used in the registered PDD (0.8426 tCO_2/ MWh) is also more conservative compared to the current grid emission factor (0.96 tCO_2/MWh) as per CEA database, version 11[30]. So, the project fulfils requirement of para 280 of the project standard, version 09.

[30] http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

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Document information

Version	*Date*	*Description*
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the “Standard: Applicability of sectoral scopes” (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revisions to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; Editorial improvement.
05.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • 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 Appendix 1; • Change the reference number from *F-CDM-PDD* to *CDM-PDD-FORM;* • Editorial improvement.
04.1	11 April 2012	• Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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