CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Title : Installation of 240 MW Hydroelectric Project at Kutehr in the Chamba district of Himachal Pradesh by JSW Energy[1]
Version : 07
Date : 17/10/2012

A.2. Description of the project activity:

JSW Energy Ltd. (JSWEL) has undertaken the construction of a 240 MW hydro power project at Kutehr in Chamba district of Himachal Pradesh. JSWEL is a group company of JSW Group which deals in generation, transmission, distribution and trading electricity.

The power project is proposed to be developed as a run-of-the-river scheme located in the upper reaches of river Ravi. The project is envisaged to harness the head available between villages Kutehr and Kharamukh, both situated along Chamba-Holi road about 70 km and 51 km, respectively, upstream of Chamba.

Pre-project Scenario
This being a Greenfield project, no power generation facility existed at the project site in the pre-project scenario.

Purpose of the project activity
The purpose of the project activity is construction and operation of a 240 MW grid connected renewable electricity generation hydro electric power plant. The project activity will reduce the GHG emission by displacement of fossil dominated grid electricity by renewable electricity. The project activity will reduce the dependence on fossil fuel of the NEWNE (new Integrated Northern, Eastern, Western and North Eastern) grid which is dominated by emission intensive coal based thermal power plants.

The selected scheme comprises a medium head peaking power project with a low-sill barrage as the diversion structure and a mainly underground water conductor system. It entails an approximately 14.6 km long headrace tunnel which culminates in a surge shaft, from where steel lined pressure shaft bring the water down to an underground powerhouse complex with tailrace discharging the water back into Ravi. The rated net head of the scheme is 278.20 m with nominal turbine discharge of 96.8 m^3/sec. The powerhouse would have an installed capacity of 240 MWThe project has a catchment area of 1,155 km^2 and the power plant reservoir will be 1,706.75 m full reservoir area with 0.65 million m^3 (MCM) live storage. The headrace tunnel will be 14,620 m length and 96.8 m^3/s design discharge. There will be three

[1] The title specified is as per the Host Country Approval for the project activity. However, the title mentioned in webhosted PDD is "Installation of 240 MW Hydroelectric Project at Kutehr in the Chamba district of Himachal Pradesh by JSW Energy Limited." And the title mentioned in the prior CDM consideration intimation into UNFCCC & MoEF was "Installation of 240 MW Hydro Electric Project at Kutehr in the Chamba district of Himachal Pradesh by JSW Energy Limited"

penstocks, each with 2.5 m diameter. The underground power house will have three Vertical Axis Francis Turbines (80.0 MW each) with rated net head 278.2 m. There will be three suspended type generators. The power generation estimated for the 90% dependable year from the hydrology study is 969.09 MU[2].

As per the DPR August 2010 (Page no. 18-3 and in annexure 18-5) also as per the CERC Notification dated: 19th Jan 2009 (Page no. 54), auxiliary is 1.2%. As per the definition given in the CERC Notification dated: 19th Jan 2009, page no. 2, *"Auxiliary energy consumption includes the quantum of energy consumed by auxiliary equipment of the generating station, and transformer losses within the generating station, expressed as a percentage of the sum of gross energy generated at the generator terminals of all the units of the generating station" and hence there is no separate transformation loss considered.*

The design energy[3] for the project activity is 969 MU.

As per the implementation between M/s JSW Energy Ltd.(JSWEL) and Director of Energy, Government of Himachal Pradesh, JSWEL would provide 12% of the Power generated at the Project free of cost to HPSEB for first 12 years. The quota of free Power would exceed to 18% in the next 18 years, and to 30% thereafter.

As per the applicable baseline methodology[4] ACM0002 (version 13.0.0), the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is - 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. The emission sources and gases included are none for the project activity (as per the applicable methodology) and CO_2 emissions from the current fuel mix in the grid in the baseline.

The proposed project activity will reduce the anthropogenic emissions of greenhouse gases (GHGs) in to the atmosphere by avoiding operation of existing fossil fuel based power plant and future capacity expansion of fossil fuel-based generation in the NEWNE Grid.

Contribution of the project activity to sustainable development

Ministry of Environment and Forests, Govt. of India has specified the social well being, economic well being, environmental well being and technological well being as the four indicators for sustainable development in the interim approval guidelines of host country approval eligibility criteria for Clean Development Mechanism (CDM) projects[5].

[2] Million Units (MU); one unit being 1 kWh

[3] CEA concurrence letter dated: 31/08/2010, Annex III, page no. 12 & as per the DPR August 2010 (Volume-I_Main Report, Part-I, Page no. 8-10)

[4] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

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

Social well-being:

- The project activity will generate many direct and indirect employment opportunities. As per the Pre Implementation agreement[6] signed by Project Participant (PP) with Government of Himachal Pradesh the project will provide employment to Bonafide local people in Himachal Pradesh, in respect of all the unskilled/skilled staff for execution, operation and maintenance of the project through local Employment Exchanges. JSW also ensures that the contractors/sub-contractors engaged by them for the project will give the employment to local people of Himachal Pradesh for appointment as supervisors, workmen and labourers/workers in the project. It has increased income security of vulnerable sections of the rural communities in the vicinity of the project site through redistribution of benefits on account of the new direct and indirect employment opportunities associated with the project.
- The project activity will indirectly help in infrastructure development in the neighbouring villages like better roads, telecommunication etc.

Economic well being:

- The construction of the hydro power plant will create employment opportunities and opportunities for the allied sectors that supply services to the local population that is expected to increase once the project is operational. This will eventually raise the economic standards of the people residing near the project activity.

Environmental well being:

- The electricity generated by the project activity will be supplied to NEWNE grid, which otherwise would have been generated by fossil fuel fired power plants in the grid reducing GHG emissions
- The project activity will help in reduction of the air pollutants (NOx, SO_2 and ash) commonly associated with fossil fuel based power generation.
- The project activity also helps in conservation of depleting fossil fuels such as coal, oil, natural gas which at present are predominantly used for power generation.
- The project activity being run-of-the-river power project will have minimum environmental impact than a reservoir based hydro power plants

Technological well being

- The successful implementation will encourage private entities and finance corporations to enter renewable power generation

As a responsible corporate, JSWEL is committed to the welfare and development of the area and the people near the Project area. JSWEL will make a detailed program for developmental activities in consultation with the local and project affected people. The project proponent undertakes to spend an amount equal to 2% of the net realization from out of Carbon Credits on any or all of the following and other sustainable development activities in consultation with the local community either directly or through contribution to the NGOs/ Self help groups which work in the region on

1. Scholarships to students

[6] DPR_August 2010_Appendix 4 Miscellaneous_Pre Impenentation Agreement_Cluase no. 19.1

2. Maintenance and up gradation of schools and ITIs in the area
3. Conducting medical camps
4. Support in operation of the public health centres
5. Maintenance of bathing ghats
6. Conducting sport events
7. Any other socio-development activities as requested by the villagers

Thus, the project activity contributes the sustainable development criteria of the host country. The detailed plan of the contribution of JSW Energy Limited towards the sustainable development as per the host country (India) criteria is described in the Annex 5 of the PDD. The same plan has been submitted to the Ministry of Environment and Forest.

A.3. Project participants:

Name of the party involved ((Host) indicates Host party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant(yes/No)
India (host)	JSW Energy Limited (private entity)	No

JSWEL is the sole owner of the project activity plant and will have rights over the entire CERs generated from the project activity.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

India

A.4.1.2. Region/State/Province etc.:

Himachal Pradesh

A.4.1.3. City/Town/Community etc.:

Kutehr village, Chamba district

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

The Kutehr hydroelectric project is proposed for development on Ravi river in Chamba district of Himachal Pradesh. The project is envisaged as a run-of-the-river scheme in the upper reaches of Ravi with project area lying between latitudes and longitudes which are mentioned below as per the CEA concurrence letter[7]:

[7] CEA Concurrence letter dated: 31/08/2010, Annex III, Page no. 10.

	Latitudes	Longitudes
Barrage Site	32°20’52” N	76°31’58” E
Powerhouse Site	32°27’36” N	76°27’36” E

The project is proposed to harness the head available between Kutehr and Kharamukh villages and is accessible via Chamba-Holi road. The barrage and powerhouse sites are approximately 70 km and 50 km, respectively, from Chamba. Appendix 1 shows the location of the project activity in India and Himachal Pradesh.

A.4.2. Category(ies) of project activity:

The project activity is renewable electricity generation from a 240 MW hydro electric power plant. Thus, the applicable category of the project activity is as follows

Sector : Energy
Scope No. : 1
Sectoral Scope : Energy industries (renewable - / non-renewable sources)

A.4.3. Technology to be employed by the project activity:

The project activity is construction and operation of 240 MW hydro electric power plant to supply electricity to the grid. The project activity being a Greenfield project, no power generation facility existed in the *pre-project scenario*. The project activity is under development presently and is estimated to be commissioned in 1st October 2016. The service provided by the project activity is the generation of 240 MW electricity. In the absence of the project activity, the equivalent power would have been generated from the existing fuel mix in the grid and the future capacity additions in the grid.

The project activity power plant is based on the Ravi. The main elements of the power plant are:

Reservoir: *(Source: CEA concurrence letter dated:* 31/08/2010 *(Annex- III, Page no. 10)*

FRL	1706.75 m
MDDL	1700 m
Live Storage	0.65 MCM
Submergence Area	11.3141 Ha

Barrage - Spillway: *(Source: CEA concurrence letter dated:* 31/08/2010 *(Annex- III, Page no. 10)*

Barrage height from foundation level	23 m
Barrage length	193.5
Barrage width at top (Bridge)	6 m
Top of Barrage	1708 m
Barrage crest Elevation	1685 m
Number of bays of spillway	5 Nos.
Gate type and size	Radial, 11m (W) x 12,5 m (H)
Stop log type and size	Vertical lift slide type, 11 m(W) x 14.9 m(H) (1 Set)

Intake (on left Abutment): *(Source: CEA concurrence letter dated:* 31/08/2010 *(Annex- III, Page no. 10)*

Number of Trash racks & size	4 Nos., 3.5 m x 10 m
Gate Type	Vertical lift fixed type (Service gate) Vertical lift slide type (Maintenance gate)
Number of gates and size	4 Nos., 3.5 m (W) x 4.75 m (H)

Feeder Tunnels: *(Source: CEA concurrence letter dated:* 31/08/2010 *(Annex- III, Page no. 10)*

Shape	Modified D- Shape
Nos. and Size	2 Nos, each of 3.5 m in Width and 5 m in height
Length	644 m/ 585 m

Desanding chambers*: (Source: CEA concurrence letter dated:* 31/08/2010 *(Annex- III, Page no. 11)*

Type	Underground
No. and size	2 Nos., 290 m (L) x 15 m (B) x 15.9 m (H)
Flushing Tunnel Gate Type	Vertical lift dlide type
Nos./size of Flushing Tunnel Gate	4 Nos., 1.55 m (W) x 2 m (H)

Head Race Tunnel: *(Source: CEA concurrence letter dated: 31/08/2010 (Annex- III, Page no. 11)*

Number and Shape	1 No., Circular
Lining type	Concrete lined
Length	14.602 km
Size	6.2 m Diameter
Design Discharge	96.8 m^3/s

Surge Shaft: *(Source: CEA concurrence letter dated*: *31/08/2010 (Annex- III, Page no. 11)*

Type	Open to sky restricted orifice vertical shaft
Diameter	15 m
Total Height	87.45 m
Surge shaft top	1737 m

Butterfly Valve: *(Source: CEA concurrence letter dated: 31/08/2010 (Annex- III, Page no. 11)*

Number and Diameter	1 No., 4.35 m Diameter

Pressure shaft: *(Source: CEA concurrence letter dated: 31/08/2010 (Annex- III, Page no. 11)*
The details of pressure shaft and unit penstock are given below

Pressure Shaft	Main Pressure Shaft	Intermediate Pressure Shaft	Unit Penstock
Type	Steel lined subsurface penstock		
Number	1	1	3
Diameter	4.35 m	3.55	2.5
Maximum discharge	96.8 m^3/s	64.53 m^3/s	32.27 m^3/s
Length of penstock	317.425 m (vertical reach 253.325 m)	17.4	38.5 m/ 32.3 m/ 42.6 m

Power House: *(Source: CEA concurrence letter dated: 31st Aug 2010(Annex- III, Page no. 11)*
The general arrangement of the powerhouse has been developed for installation of three, 80MW, vertical axis Francis turbines. The main powerhouse cavern (the Machine Hall) is of 90m (L) x 19m (W) x 44.0m (H) size. Some of the salient features of power house are as follows:

Type	Underground
Installed Capacity	240 MW
Design Head	280.47 m
Rated Discharge per Unit	32.27 Cumecs
Speed of Turbine	375 rpm
Generation Voltage/ Frequency	11 kV/ 50 Hz
Power Factor	0.9
Capacity of EOT Crane	200T/ 32T

Generator Transformers: *(Source: CEA concurrence letter dated: 31/08/2010 (Annex- III, Page no. 11)*

Numbers	10 Nos. (9+1 No. Spare)
Rating	11/220 kV, 30 MVA, Single Phase
Transformer Cavern	90 m (L) x 16 m (W) x 44 m (H)

design discharge of HRT is around96.80 m^3/s.

Tail Water Level: *(Source: CEA concurrence letter dated*: *31/08/2010 (Annex- III, Page no. 12)*
Minimum TWL at no flow: 1397 m
Normal TWL (All units at rated discharge): 1402.8 m

Tailrace Tunnel: *(Source: CEA concurrence letter dated: 31/08/2010(Annex- III, Page no. 12)*
Shape and size: Circular, 6.2 m in diameter
Length: 275 m

Switchgear: *(Source: CEA concurrence letter dated: 31/08/2010(Annex- III, Page no. 12)*

Type: GIS type located above transformer cavern.
Rating: 220 kV single breaker double bus GIS switching.
Number of bays of GIS switchgear: 6 Nos.
i) 3 generator bays ii) 1 bus coupler bay iii) 2 outgoing feeder bays

Pothead Yard: *(Source: CEA concurrence letter dated: 31/08/2010(Annex- III, Page no. 12)*

Type	Outdoor
Area	88 m (L) x 19.5 m (W)
Power Evacuation	power evacuated through 220 kV D/C transmission line to Lahal

The project activity utilizes hydro power for generation of electricity. The technology consists of conversion of the potential energy available in the water flow to mechanical energy using a hydro turbine and by connecting to a generator, mechanical energy is converted into electrical energy. In this process there is no fossil fuels burning and hence no GHG emissions. Thus, electricity is generated through sustainable means without causing any negative effect on the environment. Therefore the technology is environmentally safe and sound. The technology employed is best available in the field and environmentally safe and sound. The use of this advanced technology to harness the renewable energy source will avoid

emission of GHGs and other pollutants like CO, SOx, NOx and SPM commonly associated with power generation in general. Also, during the construction and operation phases, an approved environmental management plan is being followed as detailed in Section D.

The Power density of the project activity is more than 10 W/m^2 and hence the project emission from the project activity is as per the applied methodology is 0 i.e. $PE_{HP,y.}$ The water environment of the Ravi due to proposed project will have minor impact on the water quality and aquatic fauna of temporary nature. The project being Run-of-river, a small reservoir, which in turn operated 24 hrs, shall leave no opportunity for water getting stagnated.

Technology transfer from Annex I countries is not involved in the project activity.

As per the applicable methodology, as the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is - 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. The emission sources and gases included are none for the project activity (as per the applicable methodology – no CO_2 emissions from hydro electric power plants and also the power density of the reservoir is more than that required for considering CH_4 emissions) and CO_2 emissions from the current fuel mix in the grid in the baseline.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2016	864,716
2017	864,716
2018	864,716
2019	864,716
2020	864,716
2021	864,716
2022	864,716
2023	864,716
2024	864,716
2025	864,716
Total estimated reductions (tonnes of CO_2 e)	**8,647,163**
Total number of crediting years	**10**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	864,716

A.4.5. Public funding of the project activity:

The project cost will be met by the project proponents, project developers and in part by debt finance from banks and financial firms. Public funding, such as grants from official development assistance (ODA), is not involved in this project.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

Title: **"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"**
Reference : Approved consolidated baseline methodology ACM0002
Version : 13.0.0
Sectoral Scope : 01
EB : 67

Title : **"Tool for the Demonstration and assessment of additionality"**
Version : 06.0.0
EB : 65

Title : **"Tool to calculate the emission factor for an electricity system"**
Version : 02.2.1
EB : 63

Title : **"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"**
Version : 02
EB : 41

Among the tools referred in the applicable methodology, the first two are used in the PDD. The third tool is not applicable in the project activity and is not used in the PDD.

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

As specified in ACM0002 (version 13.0.0), the methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

The project activity is grid connected renewable power generation project activity that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant).

Applicability condition from ACM0002	Project activity condition	Remark
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	The project activity is the installation of a new, run-of-river reservoir hydro power plant.	Applicability condition is met

power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit		
In the case of capacity additions, retrofits or replacements (except for capacity addition for which the electricity generation of the existing power plant(s) or unit(s) is not affected: 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 addition or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity	The project activity is a new power plant and not capacity addition.	The condition is not relevant here
In case of hydro power plants: At least one of the following conditions must apply: • The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the reservoir; or • The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity ; or • The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity.	The proposed project activity is a new reservoir based run-off-the river hydroelectric project, and the power density of the power plant is 2121.24[8] W/m^2 and it is greater than 4 W/m^2.	Applicability condition is met
In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 after the implementation of the project activity all of the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater	Present project activity doesn't include multiple reservoirs. There are many reservoir on the same river but all are separate projects and no an integrated one.	The condition is not relevant here.

[8] Refer - Financial calculation sheet submitted to the DOE.

than 4 W/m^2; • All reservoirs and hydro power plants are located at the same river and were designed together to function as an integrated project that collectively constitutes the generation capacity of the combined power plant; • The water flow between the multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • The total installed capacity of the power units, which are driven using water from the reservoirs with a power density lower than 4 W/m^2, is lower than 15 MW; • The total installed capacity of the power units, which are driven using water from reservoirs with a power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.		
The methodology is not applicable to the following: • Project activities that involve switching from 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; • A hydro power plants that result in new single reservoir or in the increase in existing single reservoir where the power density of the reservoir is less than 4 W/m^2.	The project activity is a new hydro electric power plant and - does not involve switching from fossil fuel - does not involve biomass fired power plant - the new reservoir resulting from the hydro power plant has power density more than 4 W/m^2 which is 2121.24 W/m^2.	Applicability condition is met
In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	The project activity is a new hydro power plant and does not involve - retrofits, replacements, or capacity additions.	The condition is not relevant here

As the project activity meets all the applicability criteria of the baseline methodology ACM0002 (version 13.0.0), the methodology is applicable and can be used here.

Applicability of Methodological Tools

The methodological Tool 'Tool to calculate the emission factor for an electricity system', version 02.2.1, EB 63, Annex 19 is applicable as below

"This methodological tool determines the CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the combined margin emission factor (CM) of the electricity system. The CM is the result of a weighted average of two emission factors pertaining to the electricity system: the operating margin (OM) and the build margin (BM). The operating margin is the emission factor that refers to the group of existing power plants whose current electricity generation would be affected by the proposed CDM project activity. The build margin is the emission factor that refers to the group of prospective power plants whose construction and future operation would be affected by the proposed CDM project activity.

This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity, i.e. where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects)."

In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex-I country.

The project activity supplies electricity to the grid and in turn substitutes electricity from the grid also the project activity is not located in Annex I country, Thus the project activity can use this methodological Tool for estimation of OM, BM and CM for the purpose of calculating baseline emissions. The methodological Tool 'Tool for the demonstration and assessment of additionality'[9] version 06.0.0, EB 65, Annex 21 is applicable as below

'The document provides a general framework for demonstrating and assessing additionality and is applicable to a wide range of project types. Some project types may require adjustments to this general framework. This tool does not replace the need for the baseline methodology to provide a step-wise approach to identify the baseline scenario.'

The project activity has used this Tool as specified in the applicable baseline methodology. There is no specific applicability and this is a general framework. The project activity has used the Tool with appropriate adjustment as evident in Section B.5.

B.3. Description of the sources and gases included in the project boundary:

The project activity is construction and operation of a new 240 MW run-of-the-river hydro power plant. According to ACM0002 (version 13.0.0), for the baseline emission factor, the spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

[9] http://cdm.unfccc.int/filestorage/9/A/G/9AGSVUJ4HP731N0DRL8CYF5EXTBZKQ/eb65_repan21.pdf?t=Nnl8bTFqaXhnfDAHj46kBWAoTpqZDcxDVeLi

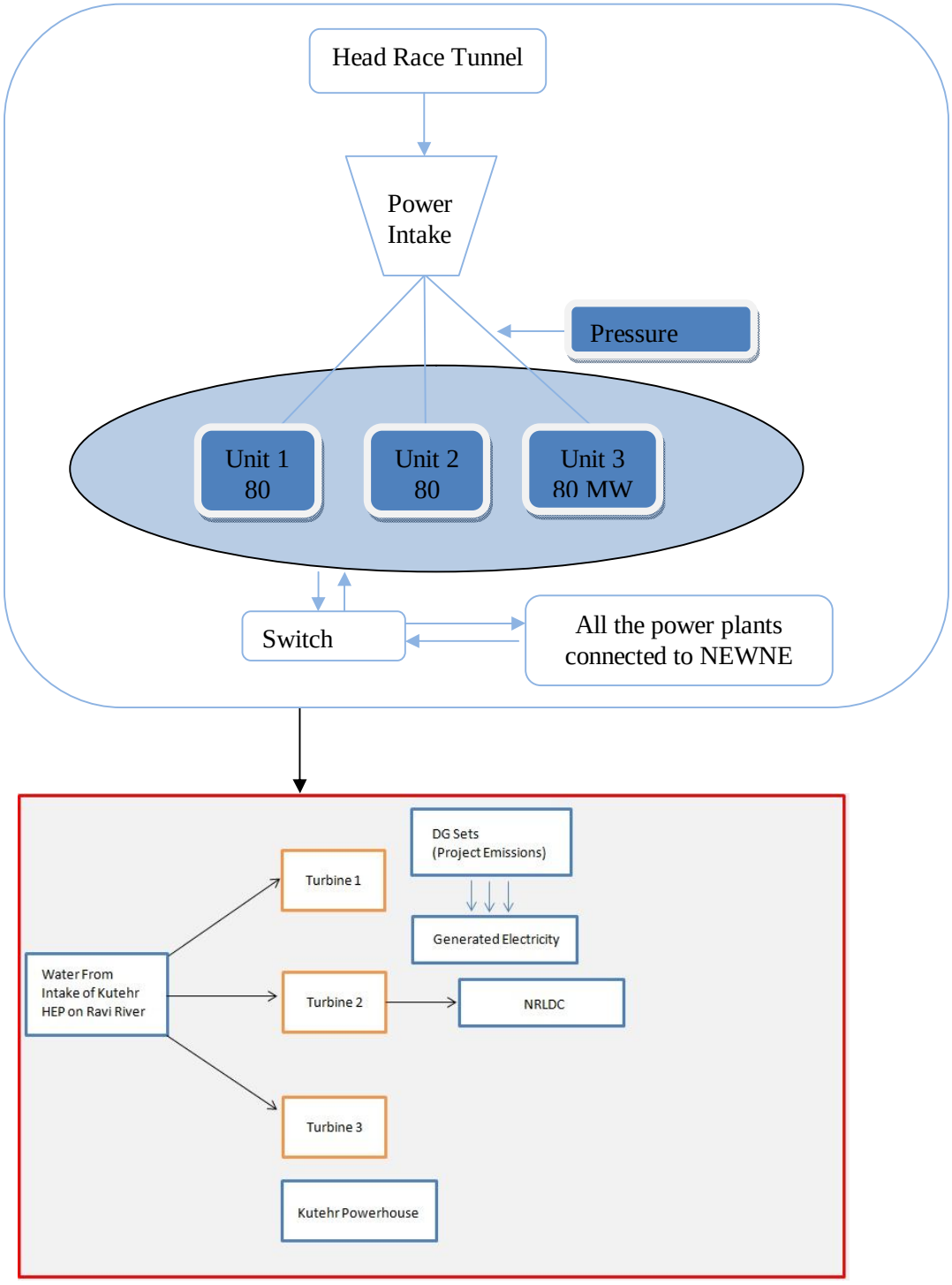


Figure: Project boundary

Scenario	Source	Gas	Included/ Excluded	Justification/Explanation
Baseline	Fossil fuel fired power plants connected to the grid	CO_2	Included	Main emission source
		CH_4	Excluded	Minor emission source, excluded as per ACM0002 for simplification.
		N_2O	Excluded	Minor emission source, excluded as per ACM0002 for simplification.
Project Activity	240 MW run-of-the-river hydro electric power plant	CO_2	Included	The project activity is renewable energy project which will not create any CO_2 emissions itself. As per ACM002 Methodology version no. 13.0.0 "The use of fossil fuels for the back up or emergency purposes (e.g. diesel generators) can be neglected. Hence there is no requirement to include the fossil fuel consumption from backup power source in the PDD.
		CH_4	Excluded	The project activity is renewable energy project which will not create any emissions itself. The power density of the reservoir is 2121.24 W/m^2 which is greater than 10 W/m^2. (Reservoir submergence area: 11.3141 hectares, Total installed capacity: 240,000,000 W). Thus, as per methodology, the power density of the project activity is above the limit where methane emissions need to be considered.
		N_2O	Excluded	The project activity is renewable energy project which will not create any emissions itself.

As the concerned project activity is a renewable energy generation facility. It does not result in the production of the greenhouse gases as per the applicable methodology.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

The baseline methodology ACM0002 (version 13.0.0), gives baseline scenario that are applicable to the project activity i.e. a new, Greenfield, renewable energy power plant.

The project concerned has the baseline is identified as below.

"If the project activity is the installation of a new grid-connected renewable power plant/unit, 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".

The calculation of the baseline emissions and emission reduction is given in the Section B.6.1 of the PDD.

The key parameters and data sources applied for calculation of emission reduction are furnished below.

Variable	Data Source
$EG_{facility,y}$ – Quantity of net electricity displaced and supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)	Calculated from design energy approved by CEA for ex-ante estimation In monitoring period, actual net electricity supplied by project activity records maintained by project proponent will be used
Parameter	**Data Source**
$EF_{grid,OM,y}$ - Operating margin CO_2 emission factor for the project electricity system in year *y* (tCO_2/MWh)	Central Electricity Authority (CEA) of India CO_2 Baseline Database for Indian Power Sector , Version 06
$EF_{grid,BM,y}$ - Build margin CO_2 emission factor for the project electricity system in year *y* (tCO_2/MWh)	
$EF_{grid,CM,y}$ - Combined margin CO_2 emission factor for the project electricity system in year *y* (tCO_2/MWh)	

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

National Scenario:

Private sector contribution in hydro power sector is large untapped. Ministry of Power, Government of India, in August 1998[10] announced Policy of Hydropower Development. The report estimated only 15% potential was tapped nationally (of potential 84,000 MW). The share of hydro power was also found to be declining annually in the total fuel mix. Under the policy, a definite goal was set to be achieved in 9th and 10th Five Year Plans. The Government declared private sector participation, different subsidies and tax incentives.

Further, during 9th and 10th Five Year Plans, the Policy identified specific hydro power capacity targets with central, state and private sector contribution[11]. The objectives of the policy were

i) Ensuring targeted capacity addition during 9th Plan
ii) Exploitation of vast hydroelectric potential at a faster pace
iii) Promoting small and mini hydel projects
iv) Strengthening the role of PSUs/ SEBs for taking up new hydel projects:
v) Increasing private investment

The policy also identified instruments to achieve the objectives in terms of founding, different promotion schemes, Renovation, Modernisation and Updating etc.

[10] http://www.powermin.nic.in/whats_new/pdf/hydro_power_policy_developmemt.pdf

[11] http://www.nhpcindia.com/writereaddata/English/PDF/hydro-policy.pdf

The project activity has considered all applicable incentives in the financial analysis such as 80IA benefits that give 10 years tax holiday (PP has to pay only MAT and no corporate tax during this period) is applicable to the project activity and this is taken care during the financial analysis. There are no other benefits applicable under these Government incentives and that can be availed.

Government Policy Instruments[12]:
To achieve the above stated objectives for the faster development of hydro potential, the Government proposes to take the following steps and measures: -

Funding
Power Development Fund
Basin wise development of Hydro Potential
Advance Action for Capacity Addition in the 10th Plan and beyond
Survey and Investigation
Inter-State Projects
Renovation, Modernisation and upgrading
Promoting Small and Mini Hydel Projects
Simplified Procedures for Transfer of Clearances
Rationalisation of Hydro Tariff
Estimates on Completion Cost (Geological Risks)
Promoting Hydel Projects with Joint Ventures
Selection of Developer and Techno Economic Clearance of CEA
Govt. Support for Land Acquisition, Resettlement & Rehabilitation, Catchment Area Development

The project activity is construction and operation of a new hydro electric power plant. In absence of the project activity, the equivalent amount of electricity would have been generated in the existing and future power plants in the NEWNE grid. Thus, the project activity avoids the emission of equivalent amount of GHGs associated with the current fuel mix in the grid.

Determination of Tariff:

Policy Guidelines of the Government of India

Central Electricity Regulatory Commission (C.E.R.C.), was constituted in July, 1988 under the Electricity Regulatory Commissions Act,1988 with the commission of Section 43A(2) of the Electricity (Supply) Act 1948, which enabled the Central Government to determine the terms and conditions of tariff, the jurisdiction to regulate tariff came to be vested in the Commission. Consequently, the Commission initiated steps to determine the terms and conditions of tariff.

Under Section 61 of the Electricity Act 2003 the Commission is to specify the terms and conditions for the determination of the tariff. Section 62 of the Act envisages that based on the terms and conditions specified by the Commission, the Commission shall determine the actual tariff.

[12] http://www.nhpcindia.com/writereaddata/English/PDF/hydro-policy.pdf

The economic appraisal and the evaluation of the Kutehr Hydroelectric Project have been made in accordance with the latest Commission regulations (No.L-7/1459160)/2008-CERC dated 19th January, 2009).

Fixation of Tariff:

As mentioned in the DPR, August 2010 (Volume I- Main Report- Part II, Page 18-3) of the project activity, the tariff has been worked out on the basis of the Central Electricity Regulatory Commission guidelines for the period 2009-14.

CERC guideline for the period 2009-14, para 22 has given the steps for computation of capacity charge and energy charge for hydro generating stations.

The detailed calculation of tariff for primary energy during thirty-five years of operation at bus bar with free power to home state is given in presented in the DPR, August 2010 (Volume I- Main Report- Part II, Page 18-5).

As mentioned above the levelised tariff for 90% Dependable Year energy for 35 years operation at 10.04% discount rate which as per DPR, August 2010 (Volume I- Main Report- Part II, Page 18-3) comes out to 3.86 Rs/kWh.

PP has not yet signed the Power Purchase Agreement with the state electricity board and PP can sign the Merchant tariff with Power trading corporation. In view of this project activity has also taken care of the Merchant tariff rate which was available at the time Investment decision (Analysis sheet of JSW PTC Limited). PP has also shared the merchant tariff rate computation with the DOE for the period of October 2009 to September 2010 which is as follows:
As per this computation the average of Indian exchange rate[13] was 3.98 Rs/kWh (This is the average price taken from Indian Energy Exchange (IEX) for the period from October 2009 to September 2010). This rate is slightly higher than the applied rate for the project activity which is getting covered in the sensitivity analysis.

Additionality:

As required by the approved 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" (Version 06.0.0) agreed by the CDM Executive Board, available at the UNFCCC CDM web site.

As per ACM0002, EB 67, version 13.0.0, page no.4
If the project activity is the installation of a new grid-connected renewable power plant/unit, 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

[13] The detailed computation and the reference of Indian Exchange Rate which is 3.98 Rs/kWh is submitted to the DOE.

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

Also as per VVM version 1.2, para 105
"The PDD shall identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the approved methodology that is selected by the proposed CDM project activity prescribes the baseline scenario and no further analysis is required."

Hence as per above description there is no need to describe Step 1. PP has justified the additionality by Step 2 which is described below:

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method
This step requires the project proponent to determine the financial analysis method that needs to be applied to carry out the investment analysis for the feasibility of the project activity. The options available with the project proponent include:

1. Simple Cost Analysis
2. Investment Comparison Analysis
3. Investment Benchmark Analysis

The option of Simple cost analysis is not applicable to the project activity as the project proponent proposes to export the electricity generated to the state electricity board and hence obtain economic benefit from the revenue generated through the sale of electricity to the state electricity board. The project proponent proposes to use the option III i.e. benchmark analysis to carry out the investment analysis of project activity.

Sub-step 2b – Option III. Apply benchmark analysis
This step requires the project proponent to select a financial tool for the project activity and compare it with the relevant benchmark value. The project proponent proposes to use the 'project IRR' as the financial indicator of the project activity. The project IRR is most extensively used financial indicator and the same was considered in the investment decision by the JSWEL Board as evident from the extracts of the minutes given to the DOE. This will be compared with the weighted average cost of capital (WACC) that has been calculated based on the returns that the investor would have obtained in the prevailing market conditions.

As per the step 2(b) of the additionality tool Version 06.0.0
"*the financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer*".

Thus among the enlisted examples in the sub-step 2(b) of the tool, the project proponent proposes to choose the 6(a) i.e. "Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data".

The benchmark has been derived based on the cost of financing and the rate of returns for the investor as mentioned in the paragraph above. The project activity involved an estimated investment of INR 17,981.30 million, which has been financed partly by the equity and remaining by debt. Thus, the returns on the project should reflect the aspirations of the debt creditors and the equity investors as per the prevailing market rates. Thus the selection of WACC as the indicator justifies both the claims as it includes both the fixed returns from the project and the returns as per the additional risk taken in a prevailing market rates.

In the guidance note issued by CDM EB at in 62nd Meeting (Annex 5) as per guidance 12,

"In case where benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated, Local commercial lending rates or weighted average cost of capital (WACC) are appropriate benchmarks for a project IRR".
As per this guidance, PP is allowed to use either of local commercial lending rate or WACC as benchmark.

PP has chosen post tax WACC as the benchmark for the reason below:

WACC alone represents the weighted average of the costs of various sources of financing in the financial structure of the project. In other words, WACC represents the minimum rate of return which the project should earn to merit consideration, as failure to earn the minimum rate of return is indicative of the erosion in the value of investment. Therefore, no other benchmark is more suitable than WACC in cases where project IRR is used to demonstrate the additionality.

As per guidance 13 of Annex 5 of EB 62,
"In the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on parameters that are standard in the market". Since the project activity under consideration can be developed by any other entity, the WACC will be calculated based on standard parameters in the market

As per guidance 15 of Annex 5 of EB 62, *"If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in the Appendix A; or by (b) calculating the cost of equity using the best financial practices"*. In accordance with this guidance, PP has option to choose either option a or b. PP has selected option b and calculated RoE and WACC as per CAPM model.

The WACC has been calculated as demonstrated below:

Calculation of WACC:

$$\mathbf{WACC = CoE * \{E/(E+D)\} + CoD_{post\ tax} * \{D/(E+D)\}}$$

Where:
E- Percentage of equity in the capital structure
D-Percentage of debt in the capital structure
CoE – Cost of equity
CoD – Cost of Debt

For Indian power sector investments, the CERC Order on Terms and Conditions of Tariff, 2009 is applicable. This Order has prescribed 70:30 debt-equity ratio. Also As per EB 62, Annex 5, para 13 and 18 the benchmark is calculated for standard D/E ratio i.e. 70:30[14] as per financing pattern of power projects in India.

As mentioned in the formula above, the documented rate of interest adjusted to the tax rate is taken as the rate of debt[15]. And the return of equity is calculated using the Capital asset pricing method (CAPM)

CAPM:
The rate using CAPM is arrived as follows,

Investment analysis has been carried out after deciding the appropriateness and conservativeness of the Benchmark. Following points have been considered while deciding the benchmark.

CoE – Cost of Equity:

The Capital Asset Pricing Model (CAPM) approach is a generally accepted methodology for determining the Cost of Equity. CAPM is based on the portfolio theory of finance in which risks are classified into:

- Systematic risk - risk applicable to the market as a whole, such as inflation, tax rises, interest rates, etc.
- Specific risk - residual risk unique to an individual firm or a small group of companies that form a subset of the market.

The theory stipulates that specific risks can be eliminated through diversification and hence, only systematic risks determine the return expectation of investors. The basis of CAPM is the relationship between risk and return. Whilst there has been considerable debate on the strength of the risk/return relationship, evidence indicates that there is a strong linear and positive relationship over the long term, which can be expressed by the following formula[16]

$$\mathbf{E(r_e) = r_f + Equity\ Beta\ (\beta) * [E(r_m) - r_f]}$$

Where:

$E(r_e)$ - the expected rate of return on equity (cost of equity)

r_f is the risk-free rate of return (e.g. return on government bonds)

$E(r_m)$ - the expected rate of return on a market portfolio

Equity Beta (β) - coefficient reflecting the volatility (risk) of the stock relative to the market, which measures the systematic risk of the stock.

[14] CERC (Terms and Conditions of Tariff) Regulations, 2009; pg. 25
http://www.cercind.gov.in/2009/February09/SOR-regulations-on-T&C-of-tariff-05022009.pdf

[15] As per the EB 62, Annex 5, Guidance 11 commercial interest rate is used.

[16] 2004, Brealy and Myers, Principles of Corporate Finance, Capital Budgeting

The **Risk free rate (r_f)** has been taken from the long term government bond rates at the time of the investment decision of the project activity in 2010. The weighted average interest rate on Central Government date Securities i.e. bond rate during the investment year[17] for 30 years of maturity period is given in the following table:

Table 4: Risk free rate

Years	Risk Free rate
2009-10 (RBI Bulletin Dated: 12/10/2010)	8.38%

The **Market Risk Premium ($E(r_m) - r_f$)**, as measured and applied in practice, is the premium above the risk-free rate of return that investors expect to earn on a well-diversified portfolio of equities.

The **expected rate of return on a market portfolio ($E(r_m)$)** has been calculated as the compounded annual growth rate of the market portfolio. In calculating market risk premium, it is usual to use an established stock market index as a proxy for the market portfolio. In India, a choice of possible indices is available namely:

- BSE Sensex – Flagship diversified index of 30 blue chip stocks.
- Bombay Stock Exchange 500 (BSE 500) – Index constituted by top 500 companies (by market cap) trading on the Bombay Stock Exchange
- National Stock Exchange Nifty 50 – Flagship diversified index of 50 blue chip stocks.

Choice of stock market index will also be considerably influenced by the availability of historical data. PP has chosen BSE Sensex to calculate the Benchmark as this is the longest running market index with base value in April 1979. Thus, it will represent conservative returns. Moreover using smaller indices like BSE Sensex is justified as it represents the most efficient face of the Indian stock market as stocks are traded more frequently and thus are in line with the assumptions of the CAPM model.

Equity Beta is the measure of the expected volatility of a particular stock relative to a well-diversified market portfolio. It measures the systematic risk of a stock, i.e. the risk that cannot be eliminated in a well-balanced, diversified portfolio. The beta of equity is calculated as the covariance between its return and the return on a well-diversified market portfolio, divided by the variance of the return on a well-diversified market portfolio.

As the project activity entails wind power generation, the equity beta to be considered should ideally be of listed wind power companies however since few such companies are available, the beta values of following companies have been considered:

Tata Power, CESC, BF Utilities, Neyveli Lignite, Jaiprakash Power Ventures Limited (JPVL), National Thermal Power Corporation (NTPC), Indsil Hydro Power and Manganese Ltd**.** (IHPML).

It is understood that since these companies are in the business of power generation their beta values on an average would provide an appropriate figure for calculating the benchmark.

[17] http://www.rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=11647

Name of company	Average Beta[18]
Tata Power	1.40
CESC	
BF Utilities	
Neyveli Lignite	
JPVL	
NTPC	
IHPML	

Cost of Equity $E(r_e) = r_f$ + Equity Beta (β)* $[E(r_m) - r_f]$

= 8.38 + 1.40*(18.27 - 8.38)

= 22.22%

Based on the above the cost of financing has been worked out, in which the standard returns in the market considering the specific return of the project type. In this manner the cost of financing works out to be 12.04%. This can be considered as a conservative benchmark for the scale of investment in specific project type (large hydroelectric power plant).

Sub-step 2c. Calculation and comparison of financial indicators

Financial analysis has been carried out for the project activity independently. This section presents the projected financial analysis of the project activity on stand-alone basis.

Generally in the financial analysis of the business plan, certain assumptions on the techno-economic parameters are made. The underlying assumptions for the financial projection have been mentioned below.

Techno Economic parameters of the project activity			Reference
Assumption			
Installed Capacity	240	MW	DPR, Ch. Executive Summary, Pg. E-5
Capacity Utilization Factor	46.09	%	DPR, Volume I, Main report, Part - I, pg 8-8
Electricity Generation	969	GWh	DPR, Ch. Executive Summary, Pg. E-26
Auxiliary Consumption	1.2	%	DPR, Volume I, Main report, Part - II, Annexure - 18-5
Transmission Loss	0	%	DPR, Volume I, Main report, Part - II, Annexure - 18-5
Free Power (up to 12 years)	12	%	DPR, Volume I, Main report, Part

[18] Source: Worksheet containing individual values is submitted to DOE for validation.

Free Power (13 to 30 years)	18	%	- II, Annexure - 18-5
Free Power (from 31years onwards)	30	%	
Operating life	35	Years	DPR, Volume I, Main report, Part - II, Annexure - 18-5
Tariff	3.86	Rs/kWh	DPR, Volume I, Main report, Part - II, Annexure - 18-5
Total Investment	17,981.30	Million INR	DPR, Ch. Executive Summary, Pg. E-55
O&M Expenses			
Operational and Maintenance including insurance (% of project cost)	2	% (Excluding R&R budget of Rs 138.323 Million)	DPR, Volume I, Main report, Part – II, Annexure – 18-5
Escalation on O&M	5.72	%	DPR, Volume I, Main report, Part – II, Annexure – 18-5
Debt Parameters			
Quantum of Debt financing	75	%	DPR, Volume I, Main report, Part - II, Annexure - 18-5
Quantum of equity financing	25	%	
Amount of Debt	13485.98	Rs. In Millions	DPR, Volume I, Main report, Part - II, Annexure - 18-5
Moratorium after start of operation	0		
Interest rate	11.50	%	DPR, Volume I, Main report, Part - II, Annexure - 18-5
Amount of Equity	4495.33	Rs. In Million	
Working Capital			
O&M Expenses	1	Months	DPR, Volume I, Main report, Part - II, Annexure - 18-5
Receivables	2	Months	
Interest on working capital	11.75	%	DPR, Volume I, Main report, Part - II, Annexure - 18-5
Taxation			
MAT including Surcharge & Cess	19.93	%	Income Tax Act (http://indiabudget.nic.in/ub2010-11/bh/bh1.pdf)_Page no. 9
Surcharge	7.50	%	Income Tax Act (http://indiabudget.nic.in/ub2010-11/bh/bh1.pdf)_Page no. 9
Education Cess	3.00	%	http://indiabudget.nic.in/ub2007-08/bh/bh1.pdf _Higher Educational cess of 1%

			and http://indiabudget.nic.in/ub2004-05/bh/bh1.pdf _Educational cess of 2%
Regular Income tax	30.00	%	Income Tax Act (http://indiabudget.nic.in/ub2005-06/bh/bh1.pdf)_Page no. 12
Regular Tax inclusive surcharge inclusive Educational cess	33.22	%	calculated
80IA Benefit 10 out of 15 years	100	%	Income Tax Act
Depreciation Rates			
Source			
Civil Works	3.34	%	DPR, Volume I, Main report, Part - II, Annexure - 18-4
Plant and Machinery	5.28	%	DPR, Volume I, Main report, Part - II, Annexure - 18-4
Depreciation Limit	90	%	DPR, Volume I, Main report, Part - II, section - 18.14.4; pg. 18-4
CDM Benefits			
Eligible Years of CDM benefits	10	Years	As per CEA Database
EF of grid	0.9032	tCO_2/MWh	As per CEA Database[19], Version 6
Rate of sale per CER	12.5	Euro/CER	As per bluenext statistics : PDF file is submitted to the DOE
Exchange Rate	62.16	Rs/Euro	As per RBI[20]

Project IRR with CDM revenue is 11.91% and IRR is 10.03% which is lower than the benchmark returns calculated based on the WACC, which is 12.04%.

The investment decision was taken by the JSWEL Board of Directors on 01/11/2010. The Revenue from the CER has been seriously considered by the project proponents before approving investment in the project activity. The CER revenue would increase the cash flow of the project activity and hence would make the project financially viable.

Sub-step 2d. Sensitivity analysis (only applicable to options II and III):

Sensitivity analysis needs to be conducted on the parameters which will have an impact on the financial analysis of the project activity. The sensitivity analysis determines the robustness of the financial analysis of the project activity.

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

[20] http://www.rbi.org.in/scripts/ReferenceRateArchive.aspx

As per guideline provided by EB in meeting no. 62 annex 5 the criteria for choosing the sensitivity analysis parameter is:
Sensitivity analysis

20. Guidance: Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets.. Where a DOE considers that a variable which constitute less than 20% have a material impact on the analysis they shall raise a corrective action request to include this variable in the sensitivity analysis.

In the project activity, the sensitivity analysis has been conducted for energy generation, capital cost and O&M cost. The commonly used parameter PLF is not referred in the PPA and has no significance. However, change in energy generation will also take care of the equivalent change in PLF. Tariff of the project activity is not set in absolute terms and has to be calculated as explained in Section A.2 of PDD. This will depend on project cost, interest rate etc. Thus, tariff alone will not change without change in these input parameters. However, for conservativeness, this is also studied for sensitivity.

Project IRR (%)	**Parameter Varied**				**Benchmark**
	Energy Generation	Capital cost	O&M cost	Tariff	12.04%
+10%	11.26%	8.76%	9.77%	11.26%	
-10%	8.71%	11.47%	10.28%	8.71%	

The above analysis shows that even a 10% increase in the important parameters does not make the project activity cross the benchmark value in the absence of CDM. Hence, it can be concluded that the financial viability of the project activity is not sensitive to these variables. Based on the sensitivity analysis, it remains quite clear that the project will not be able to cross the benchmarking without the assistance of revenue from carbon credits.

Outcome of Step 2
The project activity proves to be financially unattractive compared to the alternative available. Even the 10% increase in the important parameter that affects the returns on the project does not make project financially viable in the absence of the CDM revenue. After inclusion of the CDM revenue, the project returns cross the benchmark returns. Thus, the CDM revenue is critical for the financial viability of the project activity.

In the absence of financial viability as discussed, the natural choice of ‘no project activity’ and equivalent power generation in grid connected fossil fuel dominated power plants is realistic baseline.

Step 4: Common Practice Analysis

According to the "Tool for the demonstration assessment and of additionality", version 06.0.0; analysis of any other activities implemented previously or currently underway that are similar to the proposed project activity needs to be performed to describe whether and to which extent similar activities have already diffused in the relevant region. As per the "Demonstration of assessment of additionality", EB 65, Annex 21, Hydro projects are coming under the category (b) mentioned under para 6, Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies).
As per the para 47 of the EB 65, annex 21, these are the following measures taken for the analysis of Common Practice:

Analysis as per Guidelines on common practice (Version 01. EB 65, Annex 21)
Step 0: Applicable geographical area covers the entire host country as a default; if the technology applied in the project is not country specific, then the applicable geographical area should be extended to other countries.

The PP has chosen default applicable geographic area i.e. host country are chosen.
Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

The project activity has an installed capacity of 240 MW. Thus, power plants of capacity 120 to 360 MW capacity are considered.
Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities shall not be included in this step;

This step requires to consider only those plants that are commissioned before the start date of this project activity. However, in the case of project activity the start date has not happened, thus database available at the start of validation is used.

The data used for this analysis is taken from Central Electricity Authority CO_2 baseline database for the Indian Power Sector, version 06[21] which is publically available. While the appropriate steps has been described by applying the filters.

The total number of the project for this step is coming around 87 (Included in Annex 6). Project which is registered or which is under validation stage of CDM is excluded from this list. Please see the below list of project which are excluded from the N_{all}

S.N	Name of the Project	Reference/ Web-link
1	Grid connected 156.1 MW Combined Cycle Power plant at Hazira, Gujarat	https://cdm.unfccc.int/Projects/DB/RWTUV1296210579.43/view
2	Grid-connected Combined Cycle Power Plant of capacity 219.067 MW using Natural Gas/R-LNG as fuels at Gujarat,	https://cdm.unfccc.int/Projects/Validation/DB/4XNACF4LWVZLPLGHS7H3TTGPSRY7PX/view.html

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

	India.	
3	Grid connected 220 MW electricity generation plant using Natural Gas (NG) as a fuel at Reliance Energy Ltd. – Samalkot Power Station (REL-SPS), AP, India.	https://cdm.unfccc.int/Projects/Validation/DB/JP2D6BV2ZLWGVHAACS6JPP6J781KFV/view.html
4	Natural Gas Based Combined Cycle Power Generation, at Kothapeta, East Godaveri, Andhra Pradesh, India.	https://cdm.unfccc.int/Projects/Validation/DB/LDYISMY486VSMO0TKEJY959ZKZ2QGS/view.html

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.

As per para 4 of the Guidance, different technologies are technologies that deliver the same output and differ by (1) Energy source/ fuel, (2) Feed stock, (3) Size of installation (power capacity), (4) Investment climate in the date of the investment decision, inter alia etc. (5) Other features, inter alia. Here, PP has chosen two criterion (1) and (4). The criterion 2 and 3 are not applicable as feedstock as project activity dose not use any raw materials and size of installations is already applied in step 1. The justification for both the chosen criterion is given below:

(1) Energy Source and fuel: CEA database shows two types of projects (Thermal, Hydro) among the total 87 projects remaining at the end step 2. As per this criteria, all the Hydro power plants (which are similar to the project activity) are excluded from the step 3 and the remaining plants are 44.

(2) Investment climate in the date of the investment decision: Under this criteria, as per legal regulations PP has chosen to exclude hydro power plants commissioned before 'Electricity Act 2003[22]' in force from June 10, 2003. The Act opened electricity market to Private independent power producers (IPPs) by giving changes in the tariff principles e.g. Scope of regulatory commissions and competitive bidding, open access etc. This changed promotional policies and legal regulations in the host country making projects before this as 'different technologies'. As per above clarification the total number of plants which are excluded as per this criteria is coming around 35.

Hence, the N_{diff} = 44+35= 79 and accordingly N_{diff} is 79.

Step 4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

Thus,

F = 1-(79/87)
= 0.09

$N_{all}-N_{diff}$ = 8

[22] http://www.powermin.nic.in/acts_notification/electricity_act2003/pdf/523.pdf

Conclusion: 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 N_{all}-N_{diff} is greater than 3.

As in this case as per Step 4, F < 0.2 thus this project activity is not a common practice

CDM consideration

Prior consideration of CDM:
As per the EB 62, Annex 13, the proposed project activities with a starting date on or after 02 August 2008, the project participant must inform a Host Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status.

The project activity has notified prior consideration of the CDM in written to the NCDMA and UNFCCC secretariat on 12/01/2010. The acknowledgement from both these is available with the PP and the same is submitted to the DOE.

The construction of a new Run-of-river Hydro power project requires a significant investment. The project proponents put forward before the board that the project will result in substantial GHGs emission reduction. It was also emphasised that the project is eligible for getting the carbon revenues under CDM of Kyoto protocol, which will make the project viable.

Thus, it can be concluded that the project proponent has seriously considered the CDM revenues during the planning of the project activity. Necessary evidences of the following nature are available with the project proponent and will be made available to the DOE for validation:

- Minutes of the Board meeting for approval of the investment in project considering CDM revenue, dated 01/11/2010 is based on the CEA approved Detailed Project Report.

The additionality for the project activity has been justified by a detailed analysis of the barriers faced by the project as mentioned below:

The project timeline and CDM milestones of the project activity are summarized in following table.

Date	Project Milestone	CDM Milestone	Description of the evidence
06/06/2009	JSWEL submitted DPR to CEA.	-	Copy of issue of concurrence dated: 31/08/2010
31/08/2009	Presentation of the scheme made by JSWEL in front of appraisal group of CEA/CWC/GSI	-	Copy of issue of concurrence. dated: 31/08/2010
10/08/2009	-	Meeting of the local stakeholders at the project activity location	Minutes of the meeting and attendance

12/01/2010	-	Intimation of prior CDM consideration to UNFCCC and NCDMA	Copy of form sent and the acknowledgements received
28/04/2010	No Objection from Fisheries Department, Govt. of Himachal Pradesh	-	Copy of certificate
01/06/2010	-	Contract with the CDM consultants	Copy of the Contract
20/08/2010	No Objection from Ministry of Defence, Govt of India	-	Copy of NOC
31/08/2010	Techno economic Clearance- Central Electricity Authority, Ministry of Power, Government of India, New Delhi has concurred the project proposal after the revision suggested CEA.	-	Copy of TEC
01/11/2010	Board meeting of JSW Energy Limited. for the investment decision in project considering prospect of CDM revenue is based on the CEA approved DPR	Board considered CDM revenue for the investment approval	Minutes of the Board meeting
27/11/10	No Objection from Irrigation & Public Health Department, Govt of Himachal Pradesh	-	Copy of NOC
04/03/2011	Implementation Agreement has been signed with the Govt of Himachal Pradesh	-	Copy of agreement
31/05/2011	Approval for Diversion of Forest Land –Forest Advisory Committee Ministry of Environment and Forest (MOEF), Government of India, New Delhi,	-	Copy of Approval

10/06/2011	-	Contract with BVCPIL for validation services.	Copy of contract
16/06/2011	Expert Appraisal Committee Ministry of Environment and Forest (MOEF), Government of India, New Delhi has recommended the Environment Clearance to the project	-	Copy of Clearance
Awaited	-	NCDMA Meeting (with presentation) was held on 15/11/2011 in Delhi.	Copy of application letter
15/03/2013	PO/ EPC contract award and notice to proceed	Expected start date of CDM project activity. Further explanation has been given in PDD section C.1.1	Based on estimated date of PO/ EPC
01/10/2016	Expected commissioning	-	Estimated

Thus, the project activity proves to be additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The methodology concerned deals about two baseline scenarios

1. The installation of a new grid-connected renewable power plant/unit
2. The modification/retrofit of an existing grid-connected renewable power plant/unit

The concerned project activity is the construction and operation of a new hydro electric power plant. The first baseline scenario is suitable for the project activity as this is the installation of new grid-connected renewable power plant. As only a single baseline option is given under the described scenario, it has been applied to the project activity for calculating the emission reductions.

According to the methodology, ACM0002 (version 13.0.0), baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor ($EF_{grid\ CM\ y}$ in tCO_2/MWh), times the electricity supplied by the project activity to the grid ($EG_{PJ,y}$ in MWh) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities ($EG_{baseline}$ in MWh), as follows:

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

The project activity is not a case of modified or retrofit facility, hence $EG_{baseline} = 0$

Baseline calculations:

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

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_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)

$EF_{grid\ CM\ y} = w_1 \times EF_{OM,y} + w_2 \times EF_{BM,y}$

$EF_{OM,y}$ = Operating Margin Emission Factor (tCO_2/MWh)

$EF_{BM,y}$ = Build Margin Emission Factor (tCO_2/MWh)

$w_1 = 0.50$
$w_2 = 0.50$

The grid emission factor is the combined margin (CM) of the grid, consisting of the combination of operating margin (OM) and build margin (BM) and this is calculated by the Central Electricity Authority (CEA) India according to the procedures prescribed in the approved methodology ACM0002 (version 13.0.0) and the Tool to calculate the emission factor for an electricity system, Version 02.2.1. We have referred the same value for the baseline calculation.

The step wise calculation of emission factor is presented below.

STEP 1: IDENTIFY THE RELEVANT ELECTRICITY SYSTEMS

Historically, the India Power System was divided into five regional grids viz. Northern, Eastern, Western, Southern and North-Eastern. Each grid covered several states. Since August 2006, all the regional grids except Southern are integrated (refer table below) and are operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids are treated as a single grid and named as NEWNE grid from FY 2007-08 onwards for the purpose of CO_2 Baseline Database. Each grid covers several states. In addition, the emission factors for the preceding fiscal years (FY) 2005-06 and 2006-07 have also been back-calculated as per new definition of the grids.

As the grids are interconnected, there is inter-state and inter-regional exchange. Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Each state meets its demand with their own generation facilities and also with allocation from power plants owned by the central sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the central sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid.

Table: Geographical scopes of the two electricity grids

NEWNE Grid				Southern Grid
Northern	**Eastern**	**Western**	**North eastern**	**Southern**
Delhi Chandigarh Haryana **Himachal Pradesh** Jammu & Kashmir Punjab Rajasthan Uttar Pradesh Uttarakhand	Bihar Jharkhand Orissa West Bengal Sikkim Andaman & Nicobar	Chhattisgarh Gujarat Daman & Diu Dadar & Nagar Haveli Madhya Pradesh Maharashtra Goa	Arunachal Pradesh Assam Manipur Meghalaya Mizoram Nagaland Tripura	Andhra Pradesh Karnataka Kerala Tamil Nadu Pondicherry Lakshadweep

The regional grid thus represents the largest electricity grid where power plants can be dispatched without significant constraints and thus represents the project electricity system for the project activity. As the project activity is located in Himachal Pradesh state covered in NEWNE grid, the 'project electricity systems' covers NEWNE grid.

STEP 2: CHOOSE WHETHER TO INCLUDE OFF-GRID POWER PLANTS IN THE PROJECT ELECTRICITY SYSTEM (OPTIONAL):

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:
Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

Thus, option I is chosen i.e. only grid power plants are included in the calculation.

STEP 3: SELECT A METHOD TO DETERMINE THE OPERATING MARGIN (OM)

For calculation of operating margin four options are available:

a) Simple operating margin
b) Simple adjusted operating margin
c) Dispatch data analysis operating margin
d) Average operating margin

Any of the four methods can be used, however, the simple OM method (option a) can only be used if low-cost/must-run resources[23]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.

The share of Low cost/Must run (% of Net Generation) in the generation profile of the different grids in India in last five years.

The latest available CO_2 Baseline Database for the Indian Power Sector, Version 6[24], dated March 2011, published by CEA, has used Simple OM. The percentage share of low cost/ must run power plants in NEWNE grid is given below:

Table: Share of Low cost/ Must Run in the generation profile of Indian grid

Grid	2004-2005	2005-2006	2006-2007	2007-2008	2008–2009	2009-2010
NEWNE	25.4%	18.0%	18.5%	19.0%	17.3%	15.9%
India	18.0%	20.1%	20.9%	21.0%	18.6%	17.1%

As evident from the data above the percentage of the total grid generation by low cost/must run (on the basis of average of recent five years) for the NEWNE grid is less than 50% of the total generation. Hence simple OM can be used to calculate the operating Margin Emission Factor.

The project proponents choose an ex ante option for calculation of the OM with a three year generation weighted average, based on most recent data available at the time of submission of CDM PDD to the DOE for validation, without requirement to monitor and recalculate the emission factor during the crediting period.

STEP 4: CALCULATE THE OPERATING MARGIN EMISSION FACTOR ACCORDING TO THE SELECTED METHOD

The simple OM emission factor 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-cost / must-run power plants / units. It may be calculated as:

The simple OM may be calculated by one of the following two options:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or
Option B: 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.

[23] 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

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

The CEA- CO_2 Baseline Database (Ver. 06) provides information about the Combined Margin Emission factors of all the electricity grids in India. The combined margin in CEA database is calculated ex ante using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity system". We have therefore used the combined margin data published in the CEA Database, for calculating the baseline emission factor.

The CEA Database uses Option B, i.e. data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit, to calculate the OM of different grids.

The simple operating margin is calculated based on net electricity generation of each power unit and an emission factor for each power unit, as follow:

The emission factor of each power unit m is calculated using Option A1[25]:

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

Where:

$EF_{EL,m,y}$	is CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,m,y}$	is Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	is Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,I,y}$	is CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	is Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m	is All power units serving the grid in year y except low-cost / must-run power units
i	is All fossil fuel types combusted in power unit m in year y
y	is The relevant year as per the data vintage chosen in Step 3.

STEP 5: CALCULATE THE BUILD MARGIN (BM) EMISSION FACTOR

In terms of vintage of data, project participants can choose between one of the following two options:

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

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which

[25] "Tool to calculate the emission factor for an electricity system", Version 02.2.1.

information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The option chosen should be documented in the CDM-PDD.

PP has chosen Option 1. PP has used build margin emission factor *ex ante* based on the most recent information available on units already built for sample group *m* Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor.
The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of $AEGt_{otal}$ (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

(c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}); Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. In this case ignore steps (d), (e) and (f).

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh); If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f). Otherwise:

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM\text{->}10yrs}$)

Project participants should use the set of power units that comprises the larger annual generation.
Accordingly, the CEA Database calculates the build margin as the average emission intensity of the 20% most recent capacity addition in the grid based on net generation.

The build margin emission factor has been calculated ex-ante based on the most recent information available on the units already built for sample group m at the time of CDM PDD submission to the DOE for validation. This option does not require monitoring of the emission factor during the crediting period.

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

The CO_2 emission factor of each power unit ($EF_{EL,m,y}$) is determined as per the procedures given in step 3a for the simple OM, using option B1using for y the most recent historical year for which power generation is available, and using for m the power units included in the build margin.

If the power units included in the build margin m correspond to the sample group $SET_{sample\text{-}CDM\text{->}10yrs}$, then, as a conservative approach, only option A2 from guidance in Step 4 (a) can be used and the default values provided in Annex 1 shall be used to determine the parameter $\eta_{m,y.}$

STEP 6: CALCULATE THE COMBINED MARGIN EMISSIONS FACTOR

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:
(a) Weighted average CM; or
(b) Simplified CM.
The weighted average CM method (option A) should be used as the preferred option
.
The simplified CM method (option b) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered CDM projects at the starting date of validation; and

- The data requirements for the application of step 5 above cannot be met.

PP has chosen option (a)

The combined margin emissions factor is calculated as follows:

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

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

As per the tool, w_{OM} is 0.5 and w_{BM} is 0.5.

The Operating Margin as calculated by CEA[26] for the Northern Grid is 0.9941tCO_2/MWh (last three years generation weighted average) and the build margin for the North grid is 0.8123 tCO_2/MWh (2009-10).

By putting these values in the equation above, the combined margin emission factor of the grid is
$EF_{grid\ CM\ y}$ = 0.9032tCO_2/ MWh

Project Emissions

According to the methodology, ACM0002,
For new Hydro electric power projects with reservoirs, project proponents shall account for project emissions, estimated as follows:

a) if the power density of project is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

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

where,
$PE_{HP,y}$ is the Emission from reservoir of hydro power plants in the year y (tCO_2e)
ES_{Res} is the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 kg CO_2e /MWh.
TEGy is total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh).

As the power density of the reservoir in the project activity is more than 10 W/m^2, this project emission need not be considered. During the annual monitoring of the power density, if found less than 10 W/m^2, the project emissions will be considered.

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

b) If power density of the project is greater than 10 W/m^2
$PE_y = 0$

The power density of the project activity (*PD*) is calculated as follows:

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

Where:

PD	=	Power density of the project activity (W/m^2)
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 reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)
A_{BL}	=	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero

Hence,

Parameter	Unit	Value	Source
Installed Capacity	MW	240	DPR, August 2010, Chapter Executive Summary, Pg. E-5
Cap_{PJ}	W	240000000	http://www.unitconversion.org/power/megawatts-to-watts-conversion.html
Submergence Area(A_{PJ})	Ha	11.3141	CEA Concurrence letter dated: 31/08/2010
	m^2	113141	http://www.metric-conversions.org/area/hectares-to-square-meters.htm

Power Density = (240,000,000-0)/ (113,141-0)
= 2,121.246 W/m^2

As described above, the power density of the project activity is much greater than 10 W/m^2.

Hence for the project activity:

$PE_y = 0$

Leakage
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, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects – see applicability conditions above).

As per the methodology, the leakage need not be considered. Thus, leakage is not considered in the project activity.

$LE_y = 0$

Emission Reduction

Emission reductions are calculated as follows:
$ERy = BEy - PEy - LEy$

Here,
PEy = 0
LEy = 0

Thus,
ERy = BEy

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**$EF_{grid,OM,y}$**
Data unit:	tCO_2/TJ
Description:	The Operating Margin emission factor
Source of data used:	This is calculated as the weighted average of the recent 3 years OM data which is been provided by Central Electricity Authority (CO_2 Baseline database for the Indian power sector, Version 6.0). http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied:	0.9941
Justification of the choice of data or description of measurement methods and procedures actually applied :	To obtain homogeneity in the approach in the country to establish authentic and consistent quantification of the CO_2 emission baseline in the Indian power sector, CEA values have been used. This database by CEA is an official publication of GOI for purpose of CDM Baselines and is based on most recent data available.
Any comment:	The parameter has been calculated ex-ante and will remain fixed throughout the crediting period of the project activity

Data / Parameter:	**$EF_{grid,BM,y}$**
Data unit:	tCO_2/TJ
Description:	The Build Margin emission factor

Source of data used:	The OM data for NEWNE grid for 2009-10 which has been provided by Central Electricity Authority (CO_2 Baseline database for the Indian power sector, Version 6.0). http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied:	0.8123
Justification of the choice of data or description of measurement methods and procedures actually applied :	To obtain homogeneity in the approach in the country to establish authentic and consistent quantification of the CO_2 emission baseline in the Indian power sector, CEA values have been used. This database by CEA is an official publication of GOI for purpose of CDM Baselines and is based on most recent data available.
Any comment:	The parameter has been calculated ex-ante and will remain fixed throughout the crediting period of the project activity

Data / Parameter:	$\mathbf{EF_{grid,CM,y}}$
Data unit:	tCO_2e/MWh
Description:	Combined margin CO_2 emission factor for NEWNE grid in year y.
Source of data used:	The combined margin CO_2 emission factor is a calculated parameter based on OM and BM values sourced from Central Electricity Authority's CO_2 Baseline Emission Factor for Indian Power Sector, Version 06. This is available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied:	0.9032
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Combined margin CO_2 emission factor for NEWNE Grid has been calculated in accordance with Version 02.2.1 of "Tool to calculate the emission factor for an electric system". The weightage for Operating and Build margin emission factors are taken as 0.50 and 0.50. The operating and build margin values (including imports) have been sourced from CEA Baseline Database, version 06
Any comment:	The parameter has been calculated ex-ante and will remain fixed throughout the crediting period of the project activity

Data / Parameter:	EF_{Res}
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emissions from reservoirs of hydro power plants.
Source of data used:	The default value as per EB23 is 90 $kgCO_2e/MWh$.
Value applied:	90 $kgCO_2e/MWh$
Justification of the choice of data or description of measurement methods and procedures actually applied :	The used is default emission factor suggested in the methodology applied.
Any comment:	--

Data / Parameter:	Cap_{BL}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero
Source of data used:	Project site
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Determine the installed capacity based on recognized standards.
Any comment:	Not Applicable for the project activity.

Data / Parameter:	A_{BL}
Data unit:	m^2
Description:	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 (m^2). For new reservoirs, this value is zero
Source of data used:	Project site
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measured from topographical surveys, maps, satellite pictures, etc.
Any comment:	Not Applicable for the project activity.

B.6.3. Ex-ante calculation of emission reductions:

According to the methodology, ACM0002 (version 13.0.0) baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh), times the electricity supplied by the project activity to the grid (EG_y in MWh) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities ($EG_{baseline}$ in MWh), as follows:

$BE_y = (EG_y - EG_{baseline}) \times EF_{electricity,y}$
The project activity is not a case of modified or retrofit facility, hence $EG_{baseline} = 0$
Baseline emissions calculations is as follows

$BE_y = EG_y \times EF_{electricity,y}$

EG_y = Net quantity of electricity supplied, to the grid by the project during the year y in MWh and

$EF_{electricity,y}$ = Emission factor of the grid (tCO_2/MWh)

The Operating Margin calculated as the average of three years data provided by CEA for the NEWNE Grid is 0.9941 tCO_2/MWh and the build margin for the NEWNE Grid is 0.8123 tCO_2/MWh.

$EF_y = 0.50\times 0.9947 + 0.50 \times 0.8123\ tCO_2e/MWh = 0.9032\ tCO_2e/MWh$

Installed capacity of the Project activity (IC): 240 MW

Design Energy = 969.00×10^3 kWh

= 969,000 MWh/ annum

As described in the section A.2 auxiliary consumption is as follows:

Auxiliary Consumption = 1.2% x 969,000

= 11,628

Net Electricity Generation (EG_y) = 969,000 – 11,628
= 957,372 MWh/ annum

Emission Factor (EF_y) = 0.9032 tCO_2e/MWh

BE_y = 957,372 × 0.9032
= 864,716 tCO_2e

Project Emissions

According to the baseline methodology, ACM0002

For new Hydro electric power projects with reservoirs, project proponents shall account for project emissions, estimated as follows:

a) If the power density of project is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

$$PE_y = \frac{EF_{Res} * EG_y}{1000}$$

where,

PE_y is the Emission from reservoir expressed as tCO_2e/year

EF_{Res} is the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 kg CO_2e /MWh.

EG_y Electricity produced by the hydro electric power project in year y, in MWh

b) If the power density of the project activity (*PD*) is greater than 10 W/m^2:

$$PE_{HP,y} = 0$$

The power density of the project activity (*PD*) is calculated as follows:

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

Where:

PD	=	Power density of the project activity (W/m^2)
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 reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)
A_{BL}	=	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero

As described in section B.3 the power density of the project activity is greater than 10 W/m^2

Hence for the project activity:

$PE_y = 0$

The project activity power plant will use DG sets for back up electricity requirement.
As per ACM002 Methodology version no. 13.0.0 "The use of fossil fuels for the back up or emergency purposes (e.g. diesel generators) can be neglected." Hence there is no requirement to account the project emissions.

Leakage emissions:

As the project activity does not involve any leakage emissions it is taken as 0 (in accordance with the applicable methodology, ACM0002, version 13.0.0, page 11,). As the project activity does not involve inundation of a larger area and the power density is greater than 10 W/m^2.

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year (y)	**Estimation of Project activity emissions** (tCO_2e)	**Estimation of baseline emissions** (tCO_2e)	**Estimation of leakage** (tCO_2e)	**Estimation of overall emission reductions** (tCO_2e)
2016	0	864,716	0	864,716
2017	0	864,716	0	864,716
2018	0	864,716	0	864,716
2019	0	864,716	0	864,716
2020	0	864,716	0	864,716
2021	0	864,716	0	864,716
2022	0	864,716	0	864,716

2023	0	864,716	0	864,716
2024	0	864,716	0	864,716
2025	0	864,716	0	864,716
Total (tonnes of CO_2e)	**0**	8,647,163	**0**	8,647,163

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh
Description:	Quantity of net electricity generation supplied by the project activity to the grid in year *y*
Source of data to be used:	Joint Meter Reading (this value will be taken from main meters on two separate transmission lines)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	957,372
Description of measurement methods and procedures to be applied:	The electricity supplied by the project activity will be measured using the Main and Check electricity meter (3 phase 4 wire meter and of an accuracy of 0.2 class) installed for each of the two transmission lines at the project site. This form of measuring is in accordance with the best practices of the power industry in the host country.
QA/QC procedures to be applied:	The data will be used directly to calculate the emission reduction; hence the data will be cross checked for accuracy with the electricity generation invoice obtained from the grid. The electricity reading will be taken daily by operator and signed by the site controller. The Main and Check electricity meter will be calibrated as per the manufacture specifications by third party (Nationalised Accredited Lab). Frequency of calibration will be once in a year for both the Main and Check Electricity Meters.
Any comment:	Value used is the design energy as per the CEA letter dated: 31/08/2010 and then the auxiliary consumption is subtracted. The net energy available is also mentioned in the DPR, Volume-I_Main Report (Part II). Data archived will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	**Cap_{PJ}**
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data to be	Approved project capacity as per the Techno-economic clearance for the CEA

used:	dated: 31/08/2010
Value of data applied for the purpose of calculating expected emission reductions in section B.5	240,000,000
Description of measurement methods and procedures to be applied:	The project capacity will be monitored annually by a third party chartered engineer with test as per the appropriate National Standard of testing. Yearly – Electrical Head will ensure the measurement as per applicable standard
QA/QC procedures to be applied:	This is a third party test as per the appropriate National Standard (and will not vary from the Design Capacity), thus will not require any other QA/ QC. This data will be used to confirm that the power density of the project is greater than the minimum requirement specified by the ACM0002.
Any comment:	--

Data / Parameter:	**A_{PJ}**
Data unit:	m^2
Description:	Area of the reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data to be used:	CEA Concurrence letter, dated: 31/08/2010, Annex III, page no. 10 is used for ex-ante. Later this will be measured and certified by chartered engineer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	113,141
Description of measurement methods and procedures to be applied:	The surface area is calculated using the design schematics. This form of measuring is in accordance with the best practices of the power industry in the host country.
Monitoring frequency	Annual – civil head will ensure the measurement as per applicable standard
QA/QC procedures to be applied:	The surface area of the pondage at full volume will be measured at project commissioning from a detailed topographical survey, maps, satellite pictures etc. This data will be used to confirm that the power density of the project is greater than the minimum requirement specified by the ACM0002.
Any comment:	The surface area measurement will also be done and certified by independent third party Certified Engineer.

B.7.2. Description of the monitoring plan:

The project activity is operated and managed by the project proponent. The hydro power project abides and will abide by all regulatory and statutory requirements as prescribed under the state and central laws and regulations. A CDM project team will be established at the plant site. The project team will be entrusted with the responsibility of recording the electricity generated by the project activity which will be

measured from the meters installed at the plant site. The meters will be calibrated and sealed before being installed. The project team will also be responsible for calculation of actual creditable emission reduction in the most transparent and relevant manner. Installed meters will be calibrated according to the maintenance schedule programmed at the start of the operation and recalibrated according the plants performance requirement.

All the monitoring data will be recorded and stored electronically (spread sheets) by the Project Executor and Controller at the plant site for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later. As the important data that needs to be measured are the quantity of electricity supplied by the project activity to the grid, there is no case of data uncertainties and the generation data will be cross-checked with the export details to the grid (available from power purchaser). Only three parameters need monitoring in the project activity. The electricity dispatch will be measured by a export meter and cross checked with a check meter. If any inconsistency observed in daily reading, the meters will be checked and replaced with pre-calibrated spare meter. The power sale invoice/ bills will be used to correct the CDM monitoring requirements as that will be conservative (as approved by the power purchaser). The TEG will be also measured with a two meter system (main and check) and discrepancy will be resolved in a week from the day reported. The reservoir surface area is not likely to be changed after the commissioning is complete and in no case it will increase so much as to reduce power density below 10 W/m^2 limit of ACM0002 (version 13.0.0). So, the value fixed at the project commissioning will be used over the crediting period.

Designation	**Responsibilities**
Project Head	• Project Registration • Overall monitoring plan Execution with a special emphasis to the data archival
Project Executer and Controller plant site	• Operation • Verification of data • Inspection of data whenever necessary to independently check the authenticity of data and take corrective actions wherever required. • Storage of data • Monitoring of the data archiving
Site Main Controller	• Operation, Monitoring and Verification of Data • Data Recording • Storage of data • Data archiving
Operation and Maintenance Contractor	• Operation and Maintenance • Calibration of measuring equipments

Data uncertainty:

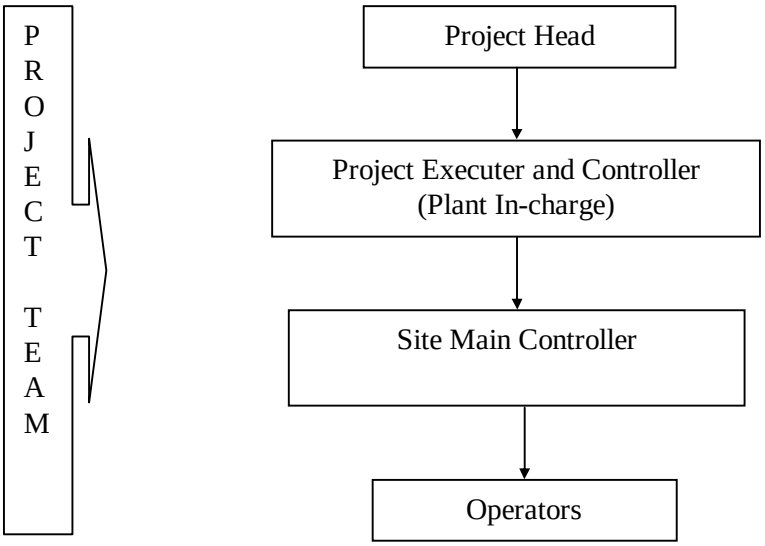
If the main meter fails to record the reading, the reading is taken through the check meter.

If during testing, the error in both the Main Meter and the Check Meter is found to exceed the maximum permissible error for a meter of that accuracy class, the Energy figure recorded by such Main meter for the previous billing month and up to the date of removal of such meter in the current month shall be corrected by applying correction factor.

In case , if the main meter and check meter fail to record the procedure as per applicable state utility will be followed. Both the meters will be immediately replaced with other meters and faulty meters will be sent for calibration. The calibration error in the main meter will be applied to all data from last confirmation of meter functioning well or the last calibration.

Data archiving:

As data archival is an important component of the monitoring process in the CDM, the project proponent will take a special care for this process. The entire data that is monitored will be maintained in the electronic format and also in the Log books for a period of crediting period + 2 years as required.



B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

Date of completing the final draft of this baseline section *(DD/MM/YYYY)*: 25/02/2012

JSWEL, Mumbai and their CDM Advisors
General Carbon (www.general-carbon.com) – not a PP

JSWEL is the project participant and contact details are given in Annex 1.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

15/03/2013 (Expected starting date) or the actual purchase order date whichever is earlier.
As per the CDM glossary on the project start date (The starting date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins. *the start date shall be considered to be the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. Minor pre-project expenses, e.g. the contracting of services /payment of fees for feasibility studies or preliminary surveys, should not be considered in the determination of the start date as they do not necessarily indicate the commencement of implementation of the project*.).

The project participant has not committed finance for the implementation of the project activity so far. There is no real action on the project site – contracts for construction or purchase orders of major equipments till date.

C.1.2. Expected operational lifetime of the project activity:

35 years 0 months[27]

C.2. Choice of the crediting period and related information:

Fixed crediting period is chosen

C.2.1. Renewable crediting period:

C.2.1.1. Starting date of the first crediting period:

Not applicable

C.2.1.2. Length of the first crediting period:

Not applicable

[27] CERC, Terms and Conditions of Tariff Regulation, 2009; pg. 9

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/10/2016 which is the estimated commissioning date of the project activity power plant or the date of registration whichever later.

C.2.2.2. Length:

10 years 0 months

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The project proponent has conducted a Third Party[28] environmental impact assessment and prepared environmental management plan as well as a Resettlement and Rehabilitation Plan for the project. The survey is conducted as per guidelines of Ministry of Environment and Forest (MOEF), Government of India (GOI) and Resettlement and Rehabilitation Policy notified by the Government of Himachal Pradesh. This project activity has received environmental clearance and the environmental impacts are not significant.

The various environmental clearances obtained are

1) Environmental Clearance -Ministry of Environment and Forest (MOEF), Government of India, New Delhi dated: 16.06.2011
2) Approval for Diversion of Forest Land -Ministry of Environment and Forest (MOEF), Government of India, New Delhi dated: 31/05/2011
3) Techno economic Clearance, Central Electricity Authority, Ministry of Power, Government of India, New Delhi dated: 31/08/2010
4) No Objection from Fisheries Department, Govt. of Himachal Pradesh has been obtained on 28.04.2010
5) No Objection from Ministry of Defence, Govt of India has been obtained on 20/08/2010
6) No Objection from Irrigation & Public Health Department, Govt of Himachal Pradesh has been obtained on 27.11.10

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

For construction of the project 85.36 ha of land is required which comprises 79.18 ha of forest land and 6.18 ha of private land. The total forest land requirement of 79.18 ha for the project falls under Bharmour Forest Division at Bharmour under Chamba Forest Circle. A compensatory afforestation in double the degraded forest area, i.e., 158.36 ha or say 159 ha is proposed to be carried out through the agency of

[28] Indian Council of Forestry Research and Education (ICFRE), Dehradun (www.icfre.org)

forest department. The other private land owners have been appropriately compensated by involvement of local Government representatives and stakeholder interactions. The various impacts identified in the EIA report as well as the mitigation measured are summarised below. The same EIA report has been published on the H.P. State Pollution Control Board (HPSCB) website[29].

Sr	Parameters & Phase	Impacts	Management Measures
1.	**LAND ENVIRONMENT**		
	Construction phase	Soil erosion due to the extraction of construction material from various quarry sites.	Proper treatment of quarry site with engineering and re-vegetation etc. Frequent Sprinkling of water in quarry area.
		Increase in turbidity in the river downstream of intake weir	Providing retaining structures on site and proper collection, use & disposal of construction spoils.
		Generation of muck due to surface and underground excavations.	Use in project activities and free of cost lifting by others. Remaining muck disposal at designated sites and provision of suitable retaining structures and vegetative cover.
	Construction phase	Acquisition of forest lands, felling of tress. Resultant shift of biotic pressure on adjoining lands.	Compensatory afforestation, CAT Plan and environment amelioration though NPV funds.
		Temporary acquisition of land for siting of construction equipment & material, waste material, etc.	No management measures are required
		Impacts due to laying multiple transmission lines	Single corridor and single transmission line for all HEPs planned in Ravi valley
		Threat to buildings due to blasting for tunneling	Maintaining adequate depth of tunnels from ground surface and use of delayed blasting technique Documentation of existing buildings and restoration in case of damage.
		Increased health related needs and incidence of water-related diseases and other health problems	Upgradation and strengthening of PHC Garola First-aid post.
	Operation phase	Generation of solid wastes from labour camps/colonies.	Disposal at designated landfill site.
		Possible seepage or leakage from the water containing or water conductor systems of the project causing erosion and damage to land	High quality watertight lining of all such components
2.	**WATER RESOURCES**		

[29] http://hppcb.nic.in/kuther.htm

	Construction Phase	Fear of drying up of springs and hand pumps due to tunneling/underground excavations.	Maintaining adequate depth of tunnels from ground surface, use of delayed blasting technique and watertight lining. Documentation of existing water sources and restoration in case of damage.
	Operation phase	Increased water needs of the project workers & staff	Water supply arrangements of the project from nearby spring/khads
		Reduce water flow between barrage and TRT outlet due to water abstraction river.	During the lean season, minimum flow of 1.77 cumecs shall be ensured d/s of barrage to maintain riverine ecology. Besides these minimum flow of seven other major rivulets d/s of barrage shall continue to flow in river Ravi
		Siltation and sedimentation of underground reservoir.	Catchment Area Treatment and periodical flushing of reservoir through flushing outlet.
3.	**WATER QUALITY**		
	Construction phase	Water pollution due to disposal sewage from labor camps	Provision of community toilets with effluent treatment system
		-	Provision of septic tanks and absorption trenches for treatment of effluents from labour camps.
	Operation phase	Deterioration of water quality in the downstream stretch of river due to reduced flow during the lean season	Minimum 15% lean season flow downstream barrage site
		Disposal of sewage from project colony.	Provision of Sewage Treatment Plant
4.	**TERRESTRIAL FLORA**		
	Construction phase	Felling of trees to facilitate project construction	Compensatory afforestation and NPV besides market cost of trees
		Possible felling of tress for meeting fuel wood requirement by labor.	Alternate arrangements of LPG. Kerosene and electricity
	Construction phase	Unauthorized collection of wild produce by project labour	Strict enforcement of laws and rules
		Road construction and debris disposal	Road side stabilization works and road side plantations (green belt development)
5.	**TERRESTRIAL FAUNA**		
	Construction phase	Disturbance to wildlife due to operation of various construction	No major wildlife is found in project area though wild life exists in project area. Avi-

		equipments.	fauna is used to human presence and disturbances.
		Unauthorized hunting, snaring and trapping or collection of wildlife by project workers	Stricter enforcement of laws and rules
	Operation phase	Disturbance to wildlife due to increased accessibility in the area.	Impact is not expected to be significant during operation storage due to underground works
6.	**NOISE ENVIRONMENT**		
	Contraction phase	Increase in noise levels due to operation of carious construction equipment.	Marginal impact, hence no large-scale. Management measures are suggested. Construction diaphragm walls at crushers & providing earplugs to labor.
		Increased Noise due to stone crusher operation and transport vehicles.	Installation of Diaphragm walls. Raising multi-tiered plantation along project roads.
	Operation Phase	Water abstraction reduced noise below baseline levels in downstream stretches of khads	No measures required as it likely to be a benevolent impact
7.	**AIR ENVIRONMENT**		
	Construction phase	Increase in air pollution due to use of machinery and other civil activities.	Water sprinklers/Cyclones will be provided near the powerhouse site and crushers.
		Dust emission from crushers & project roads.	Installation of water sprinklers at crushers. Grit laying, compaction and water spraying on project roads. Raising multi-tiered plantation along project roads. This shall be metalled finally.
		Short term increase in SO_2 levels.	Less than 17 $\mu g/m^3$. Not significant; hence no measure required.
8.	**SOCIO-ECONOMIC ENVIRONEMNT**		
	Construction phase	Reduced occupational opportunity due to land acquisition	Preferred employment to PAFs besides land cost compensation
		Law & order problems arising out of project induced immigrated of population	Establishment of Police Station/chowki
		Labour related disputes	Establishment of Labour office
		Loss of other employment opportunities	Employment as per HP Hydro-Power Policy
		-	Casual employment in road & muck stabilization works, CAT Plan works, Mine reclamation works, Compensatory & road side afforestation works and environment improvement works under NPV funds.

	Operation phase	Emission due to thermal power sources in Northern Grid	Replacement of thermal power with clean hydro-power & claiming Carbon Credits
		Increased power generation and greater employment opportunities.	-

Thu, the benefits from the project outweigh the small environmental impact and project is in line with the environmental policies of host country.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

A local stakeholders' consultation meeting was organized on 10/08/2009 in Garola village near the project activity site. PP identified local villagers, employees of power project and government officials as the most important stakeholders for the project activity. Accordingly the stakeholders were duly informed of the consultation meeting through the notice which was circulated on 18/07/2009 to the stakeholders which is 23 days advance of the meeting.

Comments of stakeholders were recorded during the stakeholder meeting.

The stake holder meeting process was followed in the following sequence

- Welcome Address
- Election of the Chair of the meeting and approval of the proposed Agenda
- Presentation of the CDM-Kyoto Protocol and role of local stake holder
- Discussion and Articulation of concerns
- Chair summarizing the local stake holder concerns
- Vote of Thanks

At the outset, Mr. PK Puri welcomed all the participants and explained the objective of the meeting. He further requested participant to elect a chairman for conducting the meeting. Mr. Mr. Puri proposed the name of Mr. Chaman Lal Sharma , Member, Tribal Advisory Committee.

Subsequently, Mr. Puri of JSWEL explained the salient features of the project & its current status (In local language with the help of schematic diagram). Then Mr. Puri invited Mr. RP Sharma of Cantor CO2e to provide the brief on the CDM project cycle and the role of local stakeholders. Mr. RP Sharma, brief the participants about the Kyoto Protocol and mechanism there-in. He elaborated on CDM and need for the project under his mechanism to catalyse sustainable development. He outlined that the local stakeholders concern are to be internalized in any project under clean development mechanism of the Kyoto Protocol.

The chairman encouraged the participants to seek clarification on the projects, its environmental and social impacts, CDM project cycle, UNFCCC and Kyoto Mechanisms. Participants were also given a handout on Kyoto Mechanism & its benefits to the project. The chairman invited the participants to voice their

concerns regarding environmental, economical, institutional, cultural impacts of the project and seek any clarifications.

A list of participants with their signature is kept for record and photographs of the event were also taken.

E.2. Summary of the comments received:

The stakeholders viewed JSW Energy Ltd. as a reputed company contributing to local socio-economy. Overall all the affected panchayat representatives, member of Block Development Committee and Zila Parishad member unanimously welcomed the project & requested JSW Energy Ltd to start the project at the earliest. They assured the full co- operation to JSW Energy Ltd. in the implementation of this project.

At the last Mr. Chaman Lal, Chairperson of the meeting summarized that the project is in the interest of country, HP state and local community and suggested all present for the speedy implementation of the project. He requested to motivate and educate the local community about the benefits of the project. The stakeholders were given a time of 23 days to receive information about the project and convey further concerns/ queries.

Specific concern/ question and the answer are delineated in the table below.

Stakeholder concerns / question / comment	Answer / outcome
Environment	
Mr. Chaman Lal Sharma, Chairman & Mr. Toofan Singh, Pradhan, Chhanoutha asked. How CO_2 emissions contribute to global warming?	CO_2 absorbs the sun light reflected from earth & warms up the atmosphere, which causes melting of ice caps, flood & drought etc. Mr. RP Sharma explained
Social	
Mr. Ramesh Shalakia, Member Gram Panchayat, Ullansa, asked dose the project increase employment opportunities in the area?	Yes, employment will be given to local people as per the HP Govt. policy. Experience of local people working in other surrounding Hydro projects will be considered during selection process. Under CSR policy people from affected panchayats will be given scholarship for upgrading their skills, making them worthy in employment in different trades.
Mr. Toofan Singh, Pradhan, Gram Panchayat, Chanhota, suggested that the priority should be given to the project affected Panchayats for disbursement of project benefits in the ratio in which the panchayats are affected.	It was assured that the suggestions of Mr. Toofan Singh will be taken care.
Mr. Punnu Ram, Ex Pradhan,	It was informed that it will be as per the HP power policy.

Stakeholder concerns / question / comment	Answer / outcome
Gram Panchayat. Kuther asked how much compensation for the land acquisition will be given.	
Mr. Ramesh Shalakia, Member Gram Panchayat. Ullansa, asked about the plans to take care of the damage, if any caused to the water supply scheme of I & PH during construction of Kuther HEP	It was told that I&HP department is taking care of the issue and JSW Energy Limited is giving as affidavit in this regard.
Mr. Chaman Lal Sharma, advised that the JSW Energy Ltd. Should initiate CSR activities in the project area.	It was assured that as per JSW policy same will be taken care shortly and R&R policy which is under preparation will be shortly made available in the site office for information.

E.3. Report on how due account was taken of any comments received:

The stakeholders were given clarification on the issues raised as above to their satisfaction. The stakeholders viewed JSW Energy Ltd. as a reputed company contributing to local socio-economy. Overall all the affected panchayat representatives, member of Block Development Committee and Zila Parishad Member unanimously welcomed the project & requested JSW Energy Ltd. to start the project at the earliest. They assured the full co-operation to JSW Energy Ltd. in the implementation of this project. At the end of meeting, the entire stakeholder appreciated the steps taken by the project proponent by providing relevant evidence of the project claims.

There were no comments from the stakeholders that required follow up action from the PP.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	JSW Energy Limited
Street/P.O.Box:	5-A, Dr. G. Deshmukh Marg
Building:	Jindal Mansion
City:	Mumbai
State/Region:	Maharashtra
Postcode/ZIP:	400 026
Country:	India
Telephone:	0091 22 23513000
FAX:	0091 22 23526400
E-Mail:	naresh.lalwani@jsw.in , alok.vijayvergiya@jsw.in
URL:	www.jsw.in
Represented by:	
Title:	Deputy General Manager
Salutation:	Mr.
Last name:	Lalwani
Middle name:	
First name:	Naresh
Department:	Corporate Strategy & Development
Mobile:	-
Direct FAX:	0091 22 23526400
Direct tel:	0091 22 23513000
Personal e-mail:	naresh.lalwani@jsw.in , alok.vijayvergiya@jsw.in

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Public funding from Annex I and diversion of official development assistance (ODA) is not involved in this project activity. The project cost is met by the project proponent through own sources and in part by the debt financing from banks.

Annex 3

BASELINE INFORMATION

There is no additional information for Baseline. Please refer B.4 and B.6 of the PDD for the Baseline Information.

Annex 4

MONITORING INFORMATION

There is no additional information for Monitoring. Please refer B.7 of the PDD for the Monitoring Information.

- - - - -

Annex 5

NOTE ON SUSTAINABLE DEVELOPMENT

JSW Energy Ltd. (JSWEL) has undertaken the construction of a 240 MW hydro power project at Kutehr in Chamba district of Himachal Pradesh. JSWEL is a vertical of JSW Group which deals in generation, transmission, distribution and trading electricity.

The power project proposed is to be developed as a run-of-the-river scheme located in the upper reaches of river Ravi. The project is envisaged to harness the head available between villages Kutehr and Kharamukh, both situated along Chamba-Holi road about 70 km and 51 km, respectively, upstream of Chamba. The purpose of the project activity is construction and operation of a 240 MW grid connected renewable electricity generation hydro electric power plant. The project activity will reduce the GHG emission by displacement of fossil dominated grid electricity by renewable electricity. The project activity will reduce the dependence on fossil fuel of the NEWNE (new Integrated Northern, Eastern, Western and North Eastern) grid which is dominated by emission intensive coal based thermal power plants.

The proposed project activity will reduce the anthropogenic emissions of greenhouse gases (GHGs) in to the atmosphere by avoiding operation of existing fossil fuel based power plant and future capacity expansion of fossil fuel-based generation in the NEWNE Grid.

Contribution of the Project Activity to Sustainable Development
Ministry of Environment and Forests, Govt. of India has specified the social well being, economic well being, environmental well being and technological well being as the four indicators for sustainable development in the interim approval guidelines of host country approval eligibility criteria for Clean Development Mechanism (CDM) projects.

Social well-being:

- The project activity will generate many direct and indirect employment opportunities. As per the Pre Implementation Agreement signed by PP with Government of Himachal Pradesh the project will provide employment to Bonafide local people in Himachal Pradesh, in respect of all the unskilled/skilled staff for execution, operation and maintenance of the project.
- JSW also ensures that the contractors/sub-contractors engaged by them for the project will give the employment to local people of Himachal Pradesh for appointment as supervisors, workmen and labourers/workers in the project. It will help increase income security of vulnerable sections of the rural communities in the vicinity of the project site through redistribution of benefits on account of the new direct and indirect employment opportunities associated with the project.
- The project activity will indirectly help in infrastructure development in the neighbouring villages like better roads, telecommunication, etc.
- The project activity will provide 12% of deliverable energy to Himachal for the first 12 years of the project activity, 18% for the next 18 years and 30% thereafter for the period beyond 30 years as per the Implementation Agreement with the Himachal Pradesh Government.
- An additional 1% free power will also be payable for Local Area Development.

- An amount of Rs. 26.97 Crores i.e. 1.5 % of the final cost of the project has been allocated for local area development as project proponent will take up local area improvement measures in education, healthcare facilities, local infrastructure, welfare facilities, preservation of culture, plantation etc for the nearby villagers
- Compensation will be provided to all the families who are losing livelihood (because of agricultural land) or homes as per the Land Acquisition Act of 1894.
- The fishermen from the project affected area having fishing rights will be issued with fishing rights in the reservoir.
- The cultivation of indigenous beans and apple will be encouraged by providing better technology and seedling of improved varieties to the local people of Himachal Pradesh.

Economic well-being:

- The construction of the hydro power plant will create employment opportunities and opportunities for the allied sectors that supply services to the local population that is expected to increase once the project is operational. This will eventually raise the economic standards of the people residing near the project activity.
- It will bring financial opportunities for the nearby district like betterment of market place in Holi District

Environmental well being:

- The electricity generated by the project activity will be supplied to NEWNE grid, which otherwise would have been generated by fossil fuel fired power plants in the grid reducing GHG emissions.
- The project activity will help in reduction of the air pollutants (NOx, SO2 and ash) commonly associated with fossil fuel based power generation.
- The project activity also helps in conservation of depleting fossil fuels such as coal, oil, natural gas which at present are predominantly used for power generation.
- The project activity being run-of-the-river power project will have minimum environmental impact than a reservoir based hydro power plants. Despite this, Project Proponent has committed almost Rs 78 Crores to the Environmental Management Plan.
- A provision of Rs 27.3 Crores has been made for the Ecology and Environment under the CAT plan.

Technological well being

- The successful implementation will encourage private entities and finance corporations to enter renewable power generation.
- The project will help promote run-of-the-river hydro power technology as having minimum environmental impact.

Monitorable Action Plan for deploying 2% of CDM revenue for Community Development

As a responsible corporate, JSWEL is committed to the welfare and development of the area and the people near the Project area. JSWEL undertakes to spend an amount equal to 2% of the net realization from the

sale of Carbon Credits, on the following community development activities by involving the local community. Such expenditure will be done only after realizing the carbon revenue. As the quantum and timing of carbon revenue is uncertain, a definitive plan at this stage is difficult. However, to the extent feasible, a monitorable action plan for deployment of 2% of potential carbon revenues is prepared.
Estimated amount CERs -: 875,492 tCO2/annum
Annual flow: Rs 420 million
2% of Annual Flow – Rs 8.41 million
(Assumptions:

1. It takes 12 months for project registration from the date of HGA
2. It takes 24 months for issuance after registration and thereafter each year
3. The price of CER is estimated as @480 at prevalent rate last month i.e. 8 Euro and EUR to INR exchange 60.

Depending on actual realization, this amount can vary. But, the 2% of realized revenue is earmarked for socio-economic development in the project area. Thus, the revenue available for this socio-economic development activities (SEDF) based on above estimated numbers will be approximately 8.41 million.

Community Actions

- Provision for scholarships for the project affected population – meritorious and economically backward students. Two types of scholarships/fellowships have been proposed, i.e. for secondary/higher secondary level and technical education for students. The estimated target annual scholarships allocated for both the categories are will be about 15% of the revenue to be spent. Accordingly, the annual expense on this activity is about Rs. 1.26 million.

- Upgradation of the existing school infrastructure facilities and to higher level.

  Access to computers/internet/e books, Good Lighting, Ventilation, Drinking Water, Lavatory and Recreation Facilities will be chosen. An estimated 15% of the revenue from the SEDF will be spent on these activities i.e. about Rs 1.26 million.

- Training in the skill identified such as driving, machine operations, repair services, NTFP processing, nursery, computer operation, gardening and electrician

  Estimated expenditure on these actions are another 15% of SEDF i.e. about Rs 1.26 million.

- Improving the existing water facilities following construction of overhead tank in each project affected village and other nearby villages and providing community drinking water systems (serving 2000 households) or providing portable energy efficient drinking water purifiers.

  Estimated expenditure on these actions will be another 20% of SEDF i.e. about Rs 1.68 million.

- Providing an ambulance near the project area with maternity facilities, organizing medical camps of specialist doctors (Gynecologist, Eye Specialist, Physiotherapist etc).

  Estimated expenditure on these actions are another 15% of SEDF i.e. about Rs 1.26 million.

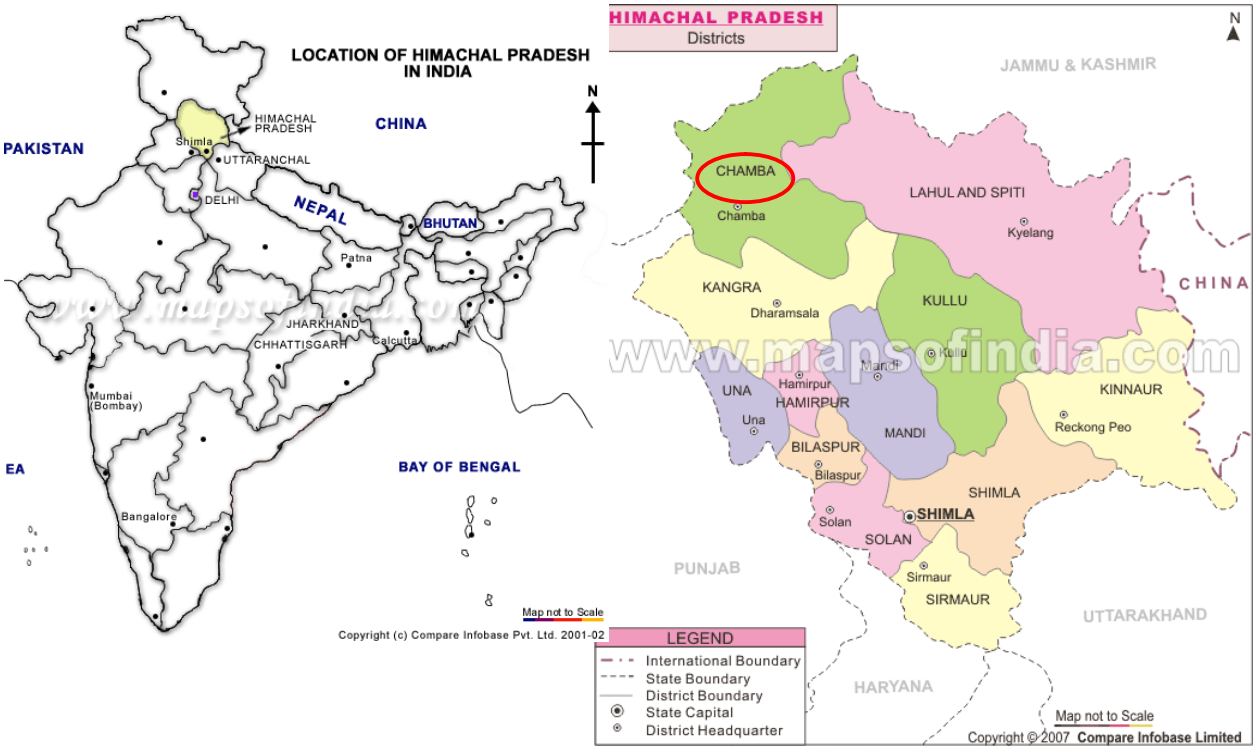
- Providing Smokeless Cook Stoves using biomass that reduces pressure on forests and plantations

  Estimated expenditure on these actions are another 20% of SEDF i.e. about Rs 1.68 million.

The time and quantum of revenue is subject to changes. The expenditure will be accordingly changed. The expenditure (2% of carbon revenue received) will be incurred within a year of carbon revenue receipt. The expenditure will be certified by a registered financial auditor and will be presented in the monitoring report or the company's annual reports/ CSR publications.
The expenses above will be in addition to any other commitment at present e.g., for obtaining environmental clearance R& R plan or Environment Management Plan or in future e.g., likely requirements by MCA for CSR expenditure by companies.

Appendix 1

Location map of the project activity



(A) Location of Himachal Pradesh in India and
(B) Location of project activity in Himachal Pradesh