Voluntary Carbon Standard
Project Description Template

19 November 2007

Date of the VCS PD: 1 August 2010

Version 02

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1 Description of Project:

1.1 Project title

Hydro Power Project in backward district of Andhra Pradesh, India

1.2 Type/Category of the project

The project activity is a renewable energy project activity. As per the VCS Board the approved project category it falls under is "Grid connected renewable electricity Generation"

Scope number-1
Sectoral scope- Energy industries (renewable - / non-renewable sources)

- The project is a VCS project activity by APGENCO which involves installation of 6 hydro-electric turbines each of 39 MW capacities totaling to 234 MW. Thus, it falls into the large scale renewable energy generation project type and has used large scale baseline methodology ACM0002 version 11. Project category which is part of a GHG program that has been approved by the VCS Board.

- The project activity is not a Grouped project

1.3 Estimated amount of emission reductions over the crediting period including project size:

An estimated emission reduction over the chosen renewable crediting period of 10 years comes around 3645200 tonnes CO_2.

Years	**Annual estimation of emission reductions in tonnes of CO2 e**
Year 1	364520
Year 2	364520
Year 3	364520
Year 4	364520
Year 5	364520
Year 6	364520
Year 7	364520
Year 8	364520
Year 9	364520
Year 10	364520
Total estimated reductions (tonnes of CO2 e)	3645200
Total number of crediting years	10

Annual average over the crediting period of estimated reductions (tonnes of CO2 e)	364520

As per VCS, the project activity falls under the Mega Project category of "project" as emission reductions are more than 1,000,000 tonnes of CO_2 equivalent per year.

1.4 A brief description of the project:

The project activity by Andhra Pradesh Power Generation Corporation Limited, hereafter refereed as APGENCO, entails phase wise installation of six run of the river hydroelectric power units, each of 39 MW capacity, on an existing reservoir where the volume and flooded area of the reservoir, built since 1992, was not increased. The first unit was commissioned in August 2008.

The power units are installed across Krishna River near Revulapally village in Mahaboobnagar district of Andhra Pradesh. The project includes construction of electric sub-stations, fabrication and installation of six hydroelectric units of 39 MW capacity each. The plant will have the total installed capacity of 234 MW. The power generated will be exported to AP State grid, which is part of Southern region (SR) grid in India. The Project will generate emission reductions by displacing electricity generation from grid connected fossil fuel-fired power plants that would otherwise be generating electricity.

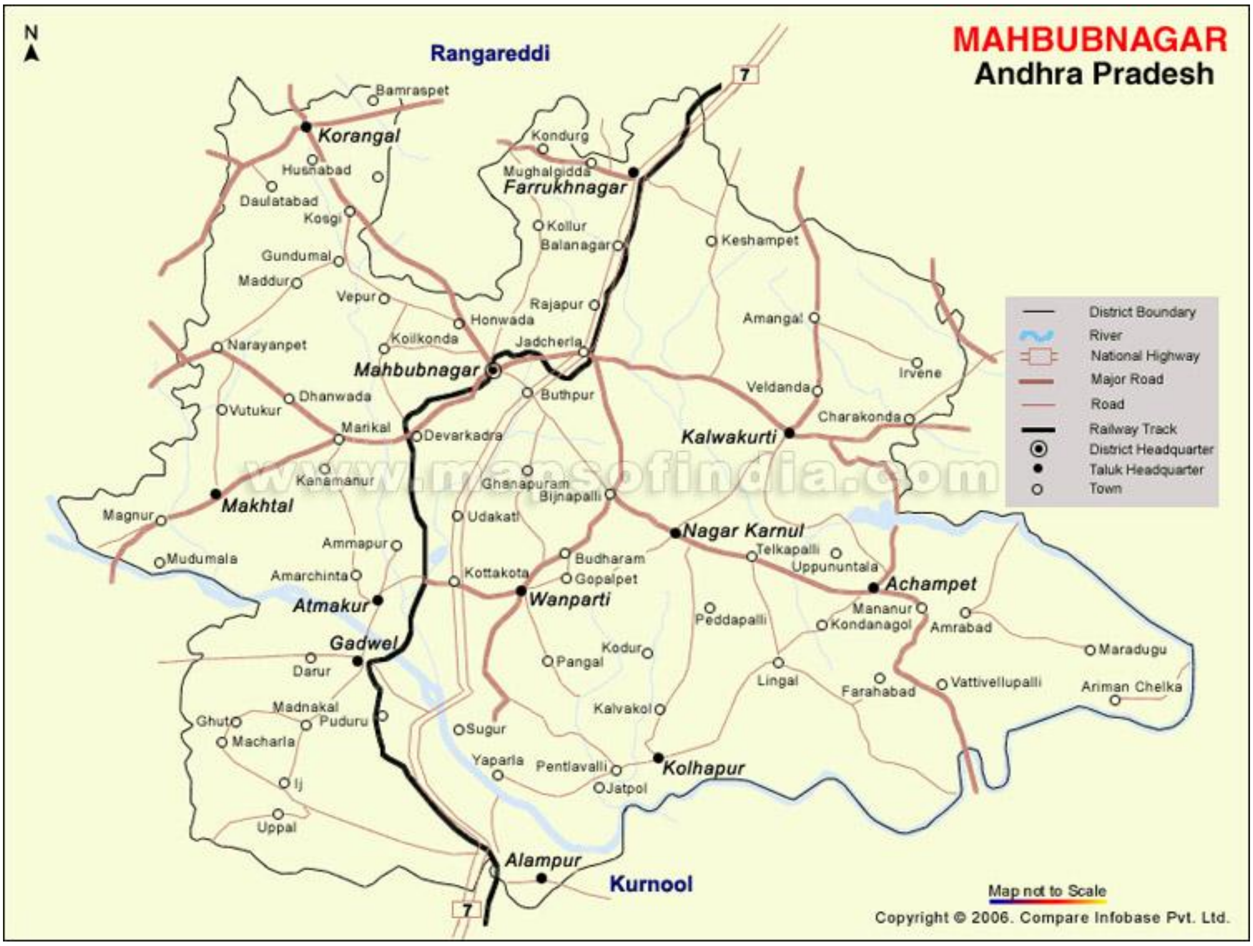
It is important to highlight that the power plant was built in an existing reservoir that was built in 1992 with the main objective of supplying water for irrigation. Now the use of the reservoir for electricity generation will add a new function to the reservoir without resulting in additional environmental impacts.

APGENCO management envisaged that the project activity will achieve following macro-objectives. In recent years, India has witnessed a huge increase in power consumption. Both public and private parties are struggling to meet the demand for electricity. The proposed hydropower project will contribute in a sustainable manner to bridge the gap between supply and demand of power on a regional and national level.

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

The Jurla hydroelectric project is installed across Krishna River near revulapally village in Mahaboobnagar district of Andhra Pradesh (between 16° 20′ 15 latitude and 70° 42′ 15" longitude), India. The project site is situated at about ½ Km from Revulapally village of Gadwal

Taluk and 18 Km down stream of the state of Karnataka. The map below shows the exact location of the project activity.



1.6 Duration of the project activity/crediting period:

Project start date: 18/08/2008[1] (The project start date is the earliest commissioning date amongst all the six hydro turbine units in this project)

Crediting Period Start date: 18/08/2008

- Estimated life time of the project: 35 years

The project activity adopts renewable crediting period, with an option to renew twice, considering the lifetime of the project activity to be more than 35 years.

1.7 Conditions prior to project initiation:

The project activity is a Greenfield project activity. In the Pre- project scenario the entire 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.

Since the project activity meets all the applicability criteria for the ACM0002 Version 11, the appropriate baseline for the concerned project activity is the generation of the electricity in the grid.

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements:

The purpose of the project activity is to generate electrical power using hydel energy, through the operation of run of the river hydro turbines in Andhra Pradesh state of India. The hydel energy generated from the hydel power plant is evacuated to the State Grid System which is part of Southern Region (SR) Grid.

Generating power through hydel plant is a clean technology as no Carbon intensive fossil fuel is burnt during the process. A hydel turbine produces power by harnessing the available potential energy. Thus, there are no GHG emissions associated with the functioning of the hydro turbines. This results in generation of clean power.

1.9 Project technologies, products, services and the expected level of activity:

The project is by Andhra Pradesh Power Generation Corporation (APGENCO) entails construction of electric sub-stations, fabrication and installation of six run of

[1] CoD letter provided to DOE

the river hydroelectric power units, each of 39MW capacity, on an existing reservoir and the reservoir volume was not increased. The plant will have total installed capacity of 234 MW. The power generated will be exported to Andhra Pradesh State grid, which is part of Southern region (SR) grid in India

Units	COD
First unit	18th Aug 2008
Second unit	29th Nov 2008
Third unit	07th Aug 2009
Fourth unit	Civil work is on
Fifth unit	
Sixth unit	

Salient Features of the projects are as follows:

20.72 m of gross water head for 234 MW total installed capacity (6 × 39 MW bulb type turbine generators).
The flooded area of the reservoir (338.12 M.cum), which is in place since 1992, remains the same.

A. Trash rack Structure

Type of structure	Segmental type
Radius	11.00m
Sill Level	+307.600M
Top of concrete cap	+520.000M

B. Intake and Vent Ways

No. of vent proposed	2 vent of 8.75m wide for each bay
No. of bays	6 No.s
Crest level of intake	+311.650M
Top of divide walls	+321.000M

C. Power House

Bottom level of power house	+203.60M
Average ground evel	+305.00M
C.L. of runner	+293.70 M
Draft tube floor level	+209.176 M
Size of Generator bay	162.00m X 25.00m
E.L. of service bay floor level	+313.70M
Runner diameters	6000/5825mm
Turbines	Bulb type turbines
No. of units	6 Nos of 39000 kW each
Discharge at max. efficiency	215 cumecs

D. Heads

Max gross head	21.92m
Max net head	21.12m

Minimum gross head	18.92
Minimum net head	18.12m
Average gross head	20.42m
Average net head	19.62m
Design head	18.0m

E. <u>Tail Race Channel:</u>

Discharge	1440 cumecs
Length of channel	690m
T.W.L for Q-1440 cumecs (one unit discharge)	+296.6m
B.L. of TRC at its start	+299.6m
Minimum width	75m
Maximum width	150m

The project activity is expected to generate 403.80 MU annually and it is calculated based on the historical records (90% dependable year). The project equipment's are sourced from world renowned manufacturers from China. The technology employed in the project activity is environmentally safe and sound.

1.10 Compliance with relevant local laws and regulations related to the project:

The project activity is not mandated by any local or national laws [2]. The project proponent however has obtained the necessary Central electricity Authority (CEA), Forest clearance approvals.

The approvals related to the project activity and the status of its compliance is demonstrated in the Table below:

Table 1: Summary of compliance with relevant local laws and regulation

Regulations	Compliance status
NOC from state government	Complied
Power Purchase Agreement with APDISCOM	Complied

Other than this, no other local law/regulation is related to the project activity.

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

Fluctuation in Design Energy (PLF): The design energy, the quantum of energy which could be generated in a 90%

[2] Electricity Act 2003, section 7
http://www.powermin.nic.in/acts_notification/electricity_act2003/pdf/Setting%20up%20of%20generating%20station.pdf

dependable year with 95% installed capacity of the generation. In other terms it is defined as fraction of the actual annual electricity generated to the installed capacity which depends on various factors that include availability of water, performance of the machine and load dispatch instructions that will be in place during operation cycle.

Based on the historical hydrological data available the design energy is arrived at 403.80 MU.

Initial stage (1-10 years) – 403.80 MU
Intermediate stage (11-20 years) – 348 MU
Ultimate stage (21-35 years) – 159.9 MU

However, it has been observed that the design energy is not stable or constant – water availability is iterant, resulting in decreased capacity utilization. The design energy plunge below over the time period. Variations in the water availability may have significant impacts on the power generated and subsequently affect the revenues for the project proponents.

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

The project activity comprising of six no of hydro electric turbines primarily supplies all the generated electricity to the regional grid. Since the project activity is renewable energy generation, there is no generation of GHG emissions in the project activity. By the generation of electricity from a renewable resource, it is replacing the grid electricity which is dominated by fossil fuels. Hence the project activity helps in the avoidance of GHG emissions associated with the power generation. Hence, the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates).

The project activity does not result in creation of any other kind of environmental credit [3] as per applicable rules in India.

1.14 Project rejected under other GHG programs (if applicable):

The project activity is not part of any other GHG program.

[3] *A letter of undertaking from the project proponent is provided to the DOE*

1.15 Project proponents roles and responsibilities, including contact information of the project proponent, other project participants:

Roles and responsibilities of project proponent

Project Proponent	Roles & Responsibilities
APGENCO	To ensure that the project activity is in compliance with all the local laws and regulation applicable to the project activity. It is under the purview of their duty to ensure that parameters are monitored in accordance with the monitoring protocol and the records are maintained in a proper manner, so that it eases the validation/verification procedures.

Contact details of project proponent:

Organization:	Andhra Pradesh Power Generation Corporation Limited (APGENCO)
Street/P.O.Box:	Khairatabad
Building:	Vidyut Soudha
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500082
Country:	India
Telephone:	+91-40-23499911, 23499912
FAX:	+91-40-23499989
E-Mail:	contactus@apgenco.com
URL:	www.apgenco.com
Represented by:	
Title:	Chief Engineer Assistant Divisional Engineer
Salutation:	Mr.
Last Name:	Rao Chakravarthy
Middle Name:	Devender Srinivasa
First Name:	M.
Department:	Commercial
Mobile:	+91-9848304825
Direct FAX:	+91-40-23499989
Direct tel:	+91-40-39839911
Personal E-Mail:	ce-comml@apgenco.com

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative,

technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information.):

The project activity promotes the growth of sustainable and renewable capacity in India and makes it less dependent on exhaustible, fast depleting and polluting fossil fuels.

- To positively contribute towards the energy-economy through conservation of natural resources like coal.
- To reduce GHG emissions at the thermal power generation end.
- Contributes substantially to the socio-economic well being of the nearby local communities.

The project's contribution to sustainable development is assessed on following criteria:

- Contribution to environmental well-being.
- Contribution to socio-economic well-being.

Contribution to environmental well-being

- Project activity contributes to the environmental well being of the nearby areas, by reducing the GHG emissions through displacement of fossil fuel dominated grid electricity generation with a hydro based electricity source.
- In India, more than 80% of total electricity production is derived from coal based power plants. Being so heavily dependant on coal for its energy requirements, this project carries environmental benefits for the country's air, soil and water sources. The project activity will displace the generation of fossil fuel power plants, reducing CO2, SOx and NOx emissions significantly, thus mitigating the air pollution and its adverse impacts on the environment.

Contribution to socio-economic well-being

The project activity has resulted in enhanced employment opportunities for operation and maintenance of the utilities. With the implementation of the project activity there has been an increase in the business opportunities for contractors, suppliers at different phases of its implementation, and Operation & Maintenance. This has improved the local economic structure and hence social status of the people involved. The activity also contributes to a significant increase in the local employment in the area of skilled jobs for operation and maintenance of the equipment.

Contribution to Technological well-being

The project activity involves highly sophisticated technically advanced hydro turbines with high efficiency and performance. Further the project demonstrates harnessing of hydro potential in run of the river mode and encourages setting up such new projects in future.

1.17 List of commercially sensitive information (if applicable):

Not Applicable

2 VCS Methodology:

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices:

- Approved consolidated baseline methodology ACM0002 Version 11, The methodology ACM0002 refers to the latest approved versions of the following tools:
- Tool to calculate the emission factor for an electricity system (Version 2.0);
- Tool for the demonstration and assessment of additionality (Version 5.2);
- Combined tool to identify the baseline scenario and demonstrate additionality (Version 2.2);
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 2.0)

However, the project activity uses the following tools:

- Tool to calculate the emission factor for an electricity system (Version 2.0);
- Tool for the demonstration and assessment of additionality (Version 5.2);

2.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The project activity meets the applicability criteria of the selected methodology ACM0002, as tabulated below:

Methodology applicability criteria	**Project activity in accordance with the applicability criteria**
This 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	The project activity is a greenfield hydro power plant that involves installation of six no hydroelectric power units at a site where no renewable power plant was operated prior to the implementation of the project activity.

retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	**Condition satisfied.**
The methodology is applicable under the following conditions: The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	The project activity involves installation of hydroelectric power units, each of 39 MW capacity, on an existing run of the river reservoir. **Condition satisfied.**
In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter EGPJ,y): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	The project activity is a greenfield hydro power plant hence this condition not applicable. **Not Applicable**
In case of hydro power plants, one of the following conditions must apply: • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or	• The project activity involves installation of hydroelectric power units, on an existing reservoir or run of the river

• The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2; or • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2.	where the volume remains unchanged. Power density = Capacity of project activity/Area of existing reservoir PD= 6 x 39 MW/74.35 ha = 314 W/Square metre • Not applicable • Not applicable
This methodology is not applicable to the following • Project activities that involve switching from fossil fuels to renewable energy 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; • Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m2.	• The project is installation of green field hydro power project hence this condition is not applicable. • Not applicable • The project activity involves installation of hydroelectric power units, on an existing run of the river reservoir where the volume remains unchanged hence this condition is not applicable.
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	The project is installation of green field hydro power project hence this condition is not applicable. **Not Applicable**

maintenance".	

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

As per ACM0002 version 11, for hydroelectric projects, the project boundary includes the physical site of the hydro power plant and all power plants connected physically to the electricity system that the project power plant is connected to. The project boundary consists of turbines, generators, transformers, transmission lines, metering equipment, connected grid sub-stations and Southern Grid.

No GHG emissions are considered for the project activity and for the purpose of determining the baseline emissions, only CO2 emissions from fossil fuel fired power plants connected to the project plant are included.

The following table summarizes the details of the GHG emissions included for the project activity.

	Source	Gas	Included?	Justification / Explanation
Baseline	Grid electricity generation	CO2	Yes	Main emission source
		CH4	No	Excluded for simplification
		N2O	No	Excluded for simplification
Project activity	For hydro power plants, emissions of CH4 from the reservoir.	CO2	No	Excluded for simplification
		CH4	No	As the project activity neither involves new reservoir nor result in increase of existing reservoir, greenhouse gas emissions from the project is not considered according to ACM0002
		N2O	No	Excluded for simplification

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario:

The applied methodology ACM 0002, version 11 defines the baseline scenario as follow.

"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 project activity is new grid connected run of the river hydro power plant with an installed capacity of 6*39 MW. In the absence of the project activity the equivalent amount of power would have been generated in the fossil fuel intensive grid connected existing and new power plants. This electricity mix as discussed in the "*Tool to calculate the emission factor for an electricity system*" is identified as the baseline scenario. Thus the renewable project activity reduces equivalent GHG emissions associated with the electricity generation.

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

Additionality of the project activity is demonstrated using the following steps of the latest version of "Tool for the demonstration and assessment of additionality" version 5.2

Step 1 Identification of alternatives to the project activity consistent with current laws and Regulations

Realistic and credible alternative(s) to the project activity are identified through the following sub-steps:

Sub-step1a- Define alternatives to the project activity

Realistic and credible alternative(s) available to the PP that provides outputs or services comparable to the project activity are listed as below:

(a) The proposed project activity undertaken without being registered as a VCS project activity

The project activity is new grid connected run of the river hydro power plant with an installed capacity of 6*39 MW. The project activity is in compliance with all the legal and regulatory requirements. However the project activity would face barriers, as listed out in Step 3 of this section, preventing its implementation.

(b) Other realistic and credible alternative scenario(s) to the proposed VCS project activity scenario that deliver outputs services (e.g., cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology

Since the applied methodology ACM0002 prescribes the baseline scenario for the project activity, further analysis is not required to be done.

(c) If applicable, continuation of the current situation (no project activity or other alternatives undertaken).

In the absence of the project activity the equivalent power would have been continued to be generated in the grid connected existing and new power plants, i.e continuation of the current situation.

Sub-step 1b- Consistency with mandatory laws and regulations

The alternatives specified above are in compliance with all applicable legal and regulatory requirements.
The appropriate baseline scenario that represents the GHG emissions in the absence of the project activity is continued power generation by the operation of existing and new power plants. Besides, implementation of the proposed project activity is not mandated by any law or regulations. Hence, the project passes this step

Step 2 Investment analysis

The project activity demonstrates additionality of the project by following Step 3: barrier analysis only.

Step 3 Barrier analysis

The sub-steps involved are as follows:

Sub-step 3a Identify barriers that would prevent the implementation of type of the proposed project activity

A: Investment barriers, other than the economic/financial barriers in Step 2 above:

The project activity is a large scale run of the river hydro power project and there were many barriers faced by project proponents for the project activity implementation. Achieving financial closure is a pre-requisite step, for an activity of this scale and nature, to commence the start of ground work. This is evident by the fact that the initial project plan was approved by Central Electricity Authority (CEA), approving body, way back in 1992 (*Source: CEA, Lr. No. 3/112/91-PAC Dt. 26.03.1992*) and despite receiving all other necessary clearances in time; project was not able to obtain consent to operate from A.P. Energy Department till 2002 (*Source: Govt of Andhra Pradesh, Energy Department, Lr No: 547/Pr.1.1/87 dated 24.5.2000).*

This is primarily due to lack of proper funding sources for the project activity and therefore even after taking the consent, the project has not achieved financial closure until 2003. Project proponents started dialogues for financial assistance with various Indian financial institutions in early 2002 but project faced many problems arranging finance. Financial closure was achieved in 2003 only, once the PFC (Power Finance Corporation) showed its willingness to lend financial assistance because of the carbon credits potential of the project activity. After PFC's involvement in the project it became easier for the project proponents to convince other financial institutions of the financial credibility of the project. The project took off only because of carbon funding.

The following are the reasons for the difficulty in securing finance for large hydro projects in India.

a) *Lack of prevailing practice - First of its kind project*

Power Finance Corporation (PFC) letter states that the project activity is first of its kind project. The APGENCO would thus be setting the precedence and thus would also encourage private investors to come up for the development of the tremendous hydro power potential existent in the state of Andhra Pradesh.

b) *Technological barrier- Lack of know-how technology*

The bulb type turbine and generator hydro unit of this large scale (6 x 39 MW) is first of its kind in India and there existing lack of know-how. Moreover, the hydro units are supplied by China National Machinery and Equipment import and export corporation, China whose technology is new to Indian market. Lack of availability of spare parts and trained work force are additional barriers.

c) *Hydrology risks-*

There is an uncertainty with respect to the availability of water in the river on which the proposed project is constructed is a major concern. The policy of Andhra Pradesh Government is water will be used primarily for irrigation and power sector is the least priority. Knowing well of this policy, PP has taken risk in installing the hydro power plant. Moreover, the requirement / consumption of water for irrigation crops are not uniform.

e) *Geology risks-*

There is a possibility of water carrying a lot of silt. This will block the flow of water into the channel and choke intake pipes. Hence, the project operation demands frequent periodical maintenance at a remote place to remove the accumulated silt, reducing the plant availability for power generation.

f) *Lack of infrastructure*

The area of the project of the Hydel scheme is an underdeveloped area. No infrastructure such as roads, electricity, communication, transportation and proper civic amenities etc. were available at the site.

g) High Capital Cost:

The development of hydro projects entail high capital cost, long gestation period, difficult terrains, geological risks, hydrological risks. This explains why out of India's hydro power potential of around 150,000 MW, only 17% has been exploited and only 14% has been used for generation, despite low Operation & Maintenance (O&M) cost involved in the operation of the projects.

h) Low Return on the Investments:

The development of the project activity without considering it as VCS project activity is financially less attractive than other investment options and not feasible. The project activity entails high capital cost and returns without considering VCS benefits would be insufficient to overcome the perceived risks.

This is the most common problem faced by other similar kinds of projects as well.

Step 3 b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)

This is demonstrated in section 2.5 above, APGENCO would not have faced any barriers in case it would opt for generation of power from existing grid. Therefore it is most likely scenario that in absence of the project activity APGENCO could opt for the business as usual scenario, i.e., generation of equivalent electricity from regional grid to cater to the State needs.

Step 4 Common practice

Sub-step 4a Analyze other activities similar to the proposed project activity

As on 31 May 2007, 23 Hydro power projects in India have been registered by UNFCCC, while 17 projects are in the validation stage. Of the 23 registered projects, only 9 projects are large scale power projects, with capacity ranging from 20 MW to 37MW, only one registered project has an installed capacity of 192 MW *(Allain Duhangan Hydroelectric Project (ADHP), Himachal Pradesh, India)* and none of the large scale projects are registered from Andhra Pradesh. Only one small scale hydro power project is registered with UNFCCC EB as CDM project from Andhra Pradesh (*4.05 MW Grid connected Small Hydroelectric Project in Andhra Pradesh, India*)

Also of the 17 projects under validation, only 4 projects are of large scale hydro power projects, with installed capacity ranging from 21 MW to 34 MW, only one project has an installed capacity of 96 MW *(Jorethang Loop Hydroelectric Project, Sikkim, India*) and two small scale hydro power project is in the validation stage from Andhra Pradesh.

The low penetration rate of large scale projects from India as CDM projects reflects the barriers faced by these projects in the region. The barriers mentioned above are some of common barriers faced by the large scale hydro power project developers.

Hence, APGENCO-6X39MW Priyadarshini Jurala Hydroelectric Project is not a common practice in Andhra Pradesh and also in India.

S. No	**Registered Project (23)**	**Scale**	**State**
1	20 MW Kabini Hydro Electric Power Project, SKPCL, India	Large	Karnataka
2	Vajra and Chaskaman small hydro projects of Vindhyachal Hydro Power Ltd., Maharashtra, India.	Small	Maharashtra
3	22 MW Mahatma Gandhi Hydro Electric Tail Race Hydro Power Project of APPL, India	Large	Karnataka
4	22.5 MW Bhilangana Hydro Power Project (BHPP)	Large	Uttaranchal
5	22.5 MW Varahi Tail Race Small Hydro Power Project of SPCL in Karnataka, India	Large	Karnataka
6	24 MW Chayadevi Mini Hydro Power Project in Karnataka, India	Large	Karnataka
7	16 MW “Patikari Hydro Electric Power Project in Distt-Mandi, Himachal Pradesh, India.”	Large	HP
8	Aleo Manali 3 MW Small Hydroelectric Project, Himachal Pradesh, India	Small	HP
9	Babanpur, Killa and Sahoke Mini Hydroelectric Projects	Small	Punjab
10	1.4+1.5+1.3 MW Dolowal, Salar and Bhanubhura Mini Hydroelectric Projects	Small	Punjab
11	2+2+1.2 MW Lohgarh, Chakbhai and Sidhana Mini Hydroelectric Projects	Small	Punjab
12	5 MW Taraila Small Hydroelectric Project of Ginni Global Ltd.	Small	HP
13	Manal, Chandni and Timbi Small Hydroelectric Projects of HCPL	Small	HP
14	2 x 5 MW Baner khad & Iku khad small hydroelectric project for a grid system	Small	HP
15	20MW Samal Grid-connected Hydroelectric Project in Orissa, India	Large	Orissa
16	"2 X 5 MW Upper khauli & Drinidhar small hydroelectric project for a grid system", Himachal Pradesh, India	Small	HP
17	25+12 MW Middle and Lower Kolab Hydroelectric Projects	Large	Orissa
18	4.05 MW Grid connected Small Hydroelectric Project in Andhra Pradesh, India	Small	AP
19	192 MW Allain Duhangan Hydroelectric Project (ADHP)	Large	HP
20	5 MW Dehar Grid-connected SHP in Himachal Pradesh, India	Small	HP
21	4.5 MW Maujhi Grid-connected SHP in Himachal Pradesh, India	Small	HP
22	10.25MW Chunchi Doddi Grid-connected SHP in Karnataka, India	Small	Karnataka
23	6MW Somanamaradi grid connected SHP in Karnataka, India	Small	Karnataka
	Validation		
1	Kuthungal run of the river 21 MW hydro power plant.	Large	Kerala
2	10MW Somasila Hydro Power Project for a grid system by Balaji Energy Pvt. Ltd.	Small	AP
3	3MW Neora Small Hydro Power Project at Darjeeling in West Bengal, India.	Small	West Bangal
4	Modification and retrofitting of the existing 34 MW hydropower plant at Bhandardara -2 (project activity) in Maharashtra state in India by Dodson –Lindblom Hydro Power Private Limited (DLHPPL).	Large	Maharashtra
5	3 MW Iruttukanam Small Hydro Electric Project by M/s Viyyat Power Pvt. Ltd.	Small	Kerala
6	Kaliganga Small Hydroelectric projects in Uttaranchal, India-10 MW bundled SSC CDM	Small	Orissa

	Project		
7	10MW Madhyamaheswar Ganga Grid - connected small hydroelectric project	Small	Uttaranchal
8	9 MW Kaldigad Grid –connected Small Hydroelectric project in Uttaranchal, India	Small	Uttaranchal
9	Upper Awa small hydroelectric project (5 MW), Himachal Pradesh, India	Small	HP
10	10 MW bundled Upper Khauli & Drinidhar small hydroelectric projects, Himachal Pradesh, India.	Small	HP
11	96 MW Jorethang Loop Hydroelectric Project, India	Large	Sikkim
12	9MW Neria small hydroelectric project, Karnataka, India	Small	Karnataka
13	24.75 MW Someshwara hydroelectric project	large	Karnataka
14	10 MW bundled Luni–2 & Luni–3 hydroelectric projects for a grid system, Himachal Pradesh, India	Small	HP
15	5MW Debal Grid-Connected Hydroelectric Project in Uttaranchal, India	Small	Uttaranchal
16	1.5MW Deogad hydroelectric project in Maharashtra India	Small	Maharashtra
17	1.00 MW Janapadu grid-connected SHP in Andhra Pradesh, India.	Small	AP

List compiled on 31 May 2007 by Krishan Kumar Kapil, FICCI-Quality Forum, New Delhi
Source: UNFCCC-CDM

Sub-step 4. Discuss any similar options that are occurring:

Below is a tabulated comparison of large scale hydro power projects from India either registered or in the validation stage. For the simplification of comparison, projects which are more than 100MW capacity is considered with one having capacity of 96MW.

Parameters	**Project 1**	**Project 2**	**APGENCO project**
Title of the project	Allain Duhangan Hydroelectric Project (ADHP)	Jorethang Loop Hydroelectric Project, India	APGENCO-6X39MW Priyadarshini Jurala Hydroelectric Project
Location	Himachal Pradesh, india	Sikkim , India	Andhra Pradesh, india
Capacity	192MW	96MW	234MW
Technology	Use of conventional technology for generation of power. (Source: CDM PDD of Allain Duhangan Hydroelectric Project (ADHP))	2 x 48 MW vertical shaft type Francis turbines, (Source: CDM PDD of Jorethang Loop Hydroelectric Project, India)	Large Bulb type turbine generators of capacity 39MW each

As can be seen from the above table that, this is largest hydro-electric power project ever been submitted to UNFCCC EB for registration from India and also includes first time installation of bulb type turbine generators of large capacity 39MW each for hydro power generation.

Hence, APGENCO’s project activity is not a common practice and is a fit case for VCS registration.

3 Monitoring:

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

Title: **"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"**

Approved consolidated baseline methodology ACM0002 Version 11

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches:

Purpose of monitoring: The purpose of an efficient monitoring procedure is to record the real and measurable emission reduction as a result of the project activity and to avail the revenues they accrue. The project team is also responsible for calculation of actual creditable emission reduction in the most transparent and relevant manner.

The roles and responsibilities of various officials at the plant site are explained in detail under section 3.4.

Parameter to be monitored: With respect to the project activity the only parameter that requires a continuous monitoring is the amount of net electricity (EGy in MWh) that is supplied by the project activity to the grid. The metering for the project activity is by joint meters (main meter and check meter). The net electricity for the project activity is given based on the reading taken at the meter installed at the plant. The net electricity accounts for auxiliary consumption.

Detail of parameter to be monitored

Data Variable	Data unit	Measured/ Calculated/ Estimated	Recording frequency	Party responsible
EGy	MWh	Measured and Calculated	Monthly	APGENCO/ APDISCOM

Data Archiving: Data will be archived for entire crediting period + 2 years

3.3 Data and parameters monitored / Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

Describe each data and parameter using this table.

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/year
Description:	Quantity of net electricity generation supplied by the project plant to the grid in year y
Source of data to be used:	Data measured and recorded from Energy meters installed at the point of interconnection

	with the grid
Value of data applied for the purpose of calculating expected emission reductions	403800
Description of measurement methods and procedures to be applied:	Quantity of net electricity supplied to the grid measured by joint meters (main and check meters) at the point of interconnection. Data type - Measured_and calculated Accuracy class – 0.2 Monitoring frequenc– Continuous and monthly recording Monitoring responsibility – Shift in-charge Calibration procedures – as per PPA/CEA regulations Calibration frequency – every 5 years as Per CEA As a standardized practice followed by APGENCO the data will be archived in electronic and paper format for two years after the crediting period
QA/QC procedures to be applied:	The value will be cross verified with the receipts/invoices raised to the power distribution company as applicable.
Any comment:	-

3.4 Description of the monitoring plan

Monitoring Plan

The hydro power plant consists of 234 MW of power generation units. The data archived include the electricity generated, auxiliary consumption and electricity export/import with the grid.

Operational and Management structure:

Monitoring Team and Responsibility:

1. Chief Engineer/Commercial: Overall responsibility of compliance with the VCS monitoring plan.
2. Superintending Engineer/O&M/Jurala HES: Quality assurance of the data/report generated by Divisional Engineer.
3. Divisional Engineer/O&M/Jurala HES: Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation.
4. Assistant Divisional Engineer (A.D.E) / MRT: Responsibility of daily report generation, log preparation, data recording.

The Chief Engineer/Commercial would be responsible for managing the entire VCS related activities and ensure quality assurance on the final data and facts recorded.

The Superintending Engineer/O&M/Jurala HES would be responsible for supervising the monitoring and archiving of data required for estimating the emission reductions. The Divisional Engineer will be responsible for generating daily, monthly and annual plant report. The Divisional Engineer in turn will be supported by the Assistant Divisional Engineer /MRT and Assistant Engineer (A.E) /MRT they would continuously monitor the data logging at the ground level.

The Chief Engineer/Commercial will have the authority to revise the monitoring plan in line with the methodology and other futuristic requirements and would be assessing the viability of the data at regular interval. The Superintending Engineer/O&M/Jurala HES in turn will report to the Chief Engineer/Commercial on monthly basis on the operational details of the project activity. APGENCO would engage its existing resources to manage, monitor and ensure quality control on the monitoring and recording of the desired data for the project activity.

The proposed team in addition to their current responsibilities would be responsible for the VCS related activities. The monitoring plan for the VCS project activity has been developed in order to determine the baseline emissions and project emissions over the entire credit period. The gross and the net electricity generated are to be determined through a robust monitoring system which comprises mainly of the energy meters.

The instrumentation and control system for the power unit is designed with adequate instruments to control and monitor the various other operating parameters for safe and efficient operation. APGENCO has employed the state of art monitoring and control equipment that will measure, record, report, monitor and control various key parameters like total power generated in the power system, auxiliary power consumption and energy exported to the grid.

The instrumentation system comprises of manual metering systems, microprocessor-based instruments of reputed make with the best accuracy available (0.2 class). All monitoring instruments are calibrated and marked at regular intervals so that the accuracy of measurement can be ensured all the time. The calibration frequency too is a part of the monitoring system.

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

Approved consolidated baseline methodology ACM0002/ Version 11, Sectoral Scope: 01, **"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"** is chosen for the proposed project activity. The justification of their applicability has already been demonstrated in section B.4.

The following equation is used to calculate the net emissions reductions from the project activity:

(A) Project Emissions.

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

Where:

PEy	= Project emissions in year y (tCO2e/yr)
PEFF,y	= Project emissions from fossil fuel consumption in year y (tCO2e/yr)
PEGP,y	= Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO2e/yr)
PEHP,y	= Project emissions from water reservoirs of hydro power plants in year y (tCO2e/yr)

Project emissions in the form of methane might result from the operation of a water reservoir if biomass is permanently submerged in the process.
However, the project activity is a hydropower plant project with existing reservoir where the volume of the reservoir is not increased, therefore there was no change in the size of the reservoir and no methane emissions from biomass decay. For run of the river hydroelectric projects, project emissions are considered zero. And moreover power density is 314 W/M2 which is more than 10 W/M2 so project emissions are zero.

Hence, PEy = 0.

(B) Baseline Emissions

Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants.

The baseline emissions are calculated as follows:

BEy = EGPJ,y * EFgrid,CM,y

Where,

BEy	= Baseline emissions in year y (tCO2e/yr)
EGPJ,y	= Quantity of net electricity generation that is produced and fed into the grid as a result

of the implementation of the roject activity in year y (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2e/yr)

Calculation of $EG_{PJ,y}$ for Greenfield renewable energy power plants

For a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then $EG_{PJ,y}$ is calculated as follows:

$$EG_{PJ,y} = EG_{facility,y}$$

Where,

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

$EG_{facility,y}$ = Quantity of net electricity

Calculation of combined margin CO_2 emission factor of the grid in year y ($EF_{grid,CM,y}$):

According to the *Tool to calculate the emission factor for an electricity system, version 02*, $EF_{grid,CM,y}$ i.e. baseline emission factor is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors.

In order to determine the OM, BM and CM, PP has applied the following six steps:
STEP 1. Identify the relevant electricity systems;
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional); STEP 3. Select a method to determine the operating margin (OM);
STEP 4. Calculate the operating margin emission factor according to the selected method;
STEP 5. Calculate the build margin (BM) emission factor;
STEP 6. Calculate the combined margin (CM) emissions factor.

Step 1: Identify the relevant electricity system

Historically, the Indian power system was divided into five independent regional grids, namely Northern, Eastern, Western, Southern, and North-Eastern. Each grid covered several states (see table below). Since August 2006, however, all regional grids except the Southern grid have been integrated 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 named as NEWNE grid in this document from FY 2007-08 onwards for the purpose of this CO2 Baseline Database. The Southern grid has also been planned to be synchronously operated with rest of all Indian Grid by early 12th Plan (2012-2017). Presently Southern grid is connected with Western and Eastern grid through HVDC link and HVDC back to back systems.

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 their 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. Moreover, there are also electricity transfers between regional grids, and small exchanges in the form of cross border imports and exports (e.g. from Bhutan).

Table B.6.1.1 Geographic scope of the two electricity grids

NEWNE Grid				**Southern Grid**
Northern	**Eastern**	**Western**	**North-Eastern**	**Southern**
Chadigarh Delhi 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 project is located in the state of Andhra Pradesh and thus supplies the electricity to the southern grid that would have been generated in this grid. Therefore the project activity would have an impact on all the generation facilities in this grid. Thus all the power generation facilities connected to this grid form the boundary for the purpose of baseline estimation. The southern grid is also connected with other regional grids, However, the net exchange of energy within the regional grids is very small and negligible and hence other regional grids are not included in the boundary for estimation of baseline emissions.

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

The PP has been chosen Option I to calculate operating margin and build margin factor i.e. only grid power plants included in the calculation.

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

The calculation of the operating margin emission factor (EFgrid,OM,y) is based on one of the following methods:

Simple OM, or
Simple adjusted OM, or
Dispatch data analysis OM, or
Average OM.

Due to non-availability of archived dispatch data in the public domain for the southern grid, 'Dispatch Data Analysis' (1c) has not been chosen, though it should be the first methodological choice.

As per *Tool to calculate emission factor of an electricity system, Version-02*, the simple operating margin (Simple OM) can be used only if low-cost/must-run resources constitute less than 50% of total grid generation in (a) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

From the available information published by Central Electricity Authority "*CO2 Baseline Database for the Indian Power Sector Version 05 November 2009*[4]", it can be seen from the table below that low cost/must run sources for southern grid accounts for less than 50% of the total generation in the last five years. Hence the Simple OM method has been used to calculate the operating margin emission factor applicable.

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)					
	2004-055	2005-06	2006-07	2007-08	2008-09
Southern	**21.6%**	**27.0%**	**28.3%**	**27.1%**	**22.8%**

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

[5] Since, *CO_2 Baseline Database for the Indian Power Sector Version 05* provides the % of net generation for share of must run resources from 2005-06 to 2008-09, the version 03 of the same database has been used to obtain the data for year 2004-05

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, using the following equation:

$EF_{OM,y} = [\Sigma_{i,j} F_{i,j,y} * COEF_{i,j}] / [\Sigma_j GEN_{j,y}]$ (3)

Where $F_{i,j,y}$ and $COEF_{i,j}$ are the fuel consumption and associated carbon coefficient of the fossil fuel i consumed by power plant j in the grid in year(s) y. $GEN_{j,y}$ is the electricity generation by power plant j connected to the grid excluding zero- or low-operating cost sources in year(s) y.

As per "Tool to calculate the emission factor for an electricity system" Version 02, the OM emission factor can be calculated using ex ante generation-weighted average of the most recent 3 years for which data is available or using ex post generation data in the year in which the project generation occurs. The OM emission factor is calculated using ex ante generation weighted average of the most recent 3 years (2006-07, 2007-08 and 2008-09) and hence does not require yearly monitoring of the OM emission factor. The simple operating margin has been obtained from "CO2 Baseline Database for the Indian Power Sector Version 05 November 2009".

Operating margin for southern grid

$EF_{grid,OM,}$ (2006-07) = 0.9991 tCO_2 / MWh
$EF_{grid,OM,}$ (2007-08) = 0.9906 tCO_2 / MWh
$EF_{grid,OM,}$ (2008-09) = 0.9729 tCO_2 / MWh

$EF_{grid,OM,y}$ = 0.9875 tCO_2/MWh

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

PP has selected option 1 i.e. to calculate the build margin emission factor ex ante based on the most recent information available on units already build for sample group m at the time of submission to the DOE for validation.

At the time of submission of PDD for the validation, the version 05 of "CO2 Baseline Database for the Indian Power Sector" was available. As per this version, the most recent year BM i.e. for year 2008-09 has been used to calculate BM emission factor. The build margin is fixed ex ante.

$EF_{grid,BM,y} = EF_{grid,BM,(2008-09)} = 0.8179\ tCO_2/MWh$

Step 7. 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 projects at the starting date of validation; and The data requirements for the application of step 5 above cannot be met.

PP has chosen to use the weighted average CM method (option A).

The weighted average combined margin is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * w_{OM} + EF_{grid,BM,y} * w_{BM} \quad (4)$$

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

For wind and solar projects, as per "Tool to calculate the emission factor for an electricity system Version 02", the default weights are as follows:

$w_{OM} = 0.50$ and $w_{BM} = 0.50$

$EF_{grid,CM,y} = 0.50 * 0.9875 + 0.50 * 0.8179$

= 0.9027 tCO_2/MWh

(C) Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport). These emissions sources are neglected.

$LE_y = 0$

(D) Emission Reductions

The emission reduction ER_y by the project activity during a given year y is the difference between baseline emissions (BE_y) and project emissions (PE_y), as follows:

$$ER_y = BE_y - PE_y$$

Where,

ER_y = Emission reductions in year y (t CO_2e/yr)
BE_y = Baseline emissions in year y (t CO_2/yr)
PE_y = Project emissions in year y (t CO_2e/yr)

4.2 Quantifying GHG emissions and/or removals for the baseline scenario:

Baseline Emissions:

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

Where,

BE_y = Baseline emissions in year y (tCO_2e/yr)
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh/yr)
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2e/yr)

Calculation of $EG_{PJ,y}$ for Greenfield renewable energy power plants

For a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then $EG_{PJ,y}$ is calculated as follows:

$$EG_{PJ,y} = EG_{facility,y}$$

Where,

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

EGfacility,y = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

= 403.80 MU

= 403800MWh/yr

CO2 emission factor of the grid in year y

EFgrid,CM,y= EFgrid,OM,y*wOM+EFgrid,BM,y*wBM

=0.9875 (tCO2/MWh) * 0.50 + 0.8179 (tCO2/MWh) * 0.50

= 0.9027 t CO2/MWh

Baseline Emissions in year y

BEy = 403800MWh/yr x 0.9027 t CO2/MWh
= 364520 t CO2/yr

4.3 Quantifying GHG emissions and/or removals for the project:

Estimation of Project Emissions
The project activity is a hydropower plant project with existing reservoir where the volume of the reservoir is not increased, therefore there was no change in the size of the reservoir and no methane emissions from biomass decay. For run of the river hydroelectric projects, project emissions are considered zero. Hence according to ACM0002, there will be no project emissions in the project

$PE_y = 0$

Estimation of Leakage Emissions

As per ACM0002, no leakage has been considered for the calculation of emission factor

$LE_y = 0$

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project:

The emission reductions are estimated by:

ERy = BEy – PEy – Ly

Where:
BEy = Baseline emission due to the project in the year y, tCO_2e/annum
PEy = Project emission due to the project in the year y, tCO_2e/annum

Ly = Leakage due to the project during the year y, tCO_2e/annum

Year	**Estimation of project activity emissions (tonnes of CO2e)**	**Estimation of baseline emission (tonnes of CO2e)**	**Estimation of leakage (tonnes of CO2e)**	**Estimation of overall emission reductions tonnes of CO2e)**
Year 1	0	364520	0	364520
Year 2	0	364520	0	364520
Year 3	0	364520	0	364520
Year 4	0	364520	0	364520
Year 5	0	364520	0	364520
Year 6	0	364520	0	364520
Year 7	0	364520	0	364520
Year 8	0	364520	0	364520
Year 9	0	364520	0	364520
Year 10	0	364520	0	364520
Total (tonnes of CO2e)	**0**	**3645200**	**0**	**3645200**

5 Environmental Impact:

During the operation of the plant, the project will receive consent from the Andhra Pradesh Pollution Control Board (APPCB) for air and water pollution. That the project meets the stipulated limits will be monitored as part of the overall VCS process their compliance reported.

The following clearances were obtained for the project activity:

- The No Objection certificate by Andhra Pollution control board vide their Lr. No. 192/PCB/85-3891, dated 17.1.1987
- The project report for power generation has been approved by Central Electricity Authority, vide Lr. No. 3/112/91-PAC Dt. 26.03.1992.
- The Environmental Clearance has been received from Ministry of Environment & Forest vide their Lr. DT. 21.04.1994.

6 Stakeholders comments:

The stakeholders identified for the project were: the villagers around and the local communities, NGOs, state government, governmental agencies, employees, contractors and consultants/advisors, who they assumed would have an interest in the project activity. The local stakeholder review which was undertaken through an invitation of comments from all stakeholders via issuance of letter to them. A copy of issued letter is submitted to DOE's during validation. A notice was also placed in the local newspaper, informing public about the proposed VCS project and inviting comments. The meeting was conducted on 8th July 2008 at the Guest house of the project site located near to the project activity.

The meeting began with the welcome note by APGENCO officials to all the stakeholders. The issue of global warming, climate change, its adverse effect and how to reduce those effects such as by employing renewable energy sources of power like hydro, wind were discussed in detail. The role of local stakeholder, environmental & social impact with respect to the project was also explained and discussed in detail.

After a brief discussion regarding the consequences and impacts of this project activity the comment pertaining to project activity were received and answered in the meeting. The stakeholders viewed Project proponents as a reputed group of companies contributing to the local economy.

- The stakeholders were appreciative of the project as it aides in sustainable development of the region. No negative comment was received as the project was generation of electricity through renewable energy sources.

The project activity has received positive comments from local villagers, the government and non-government parties. No adverse comments were received that required corrective action.

7 Schedule:

The project schedule as per VCS guidelines is tabulated in table below:

Parameter	***Date/period***
Initiation of project (earliest commissioning date)	18/08/2008[6]
Project lifetime	35 years
VCS PDD completion	01/08/2010
Begin VCS Validation	01/04/2010
Monitoring frequency	Once every month
Project termination	2043

8 Ownership:

8.1 Proof of Title:

[6] Commissioning of the first hydro turbine

For the ownership details of the project any of the following may be referred to:

Power Purchase Agreement (PPA) between APGENCO and APDISCOM
Commissioning certificates

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

The project does not participate in any other emission trading program for the proposed verification term