CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.

SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

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10 MW Somasila Hydro Power Project for a grid system by Balaji Energy Pvt.Ltd
Version: 02 (22/02/07)

A.2. Description of the small-scale project activity:

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The purpose of the "10MW Somasila Hydro Power Project" is to produce clean electrical energy in a sustainable manner, optimising the utilization of renewable hydro resource in order to contribute to meet the local power demand in a system already overwhelmed by power production by thermal power plants utilizing fossil fuels. In the context of current power and energy shortage and the ever-increasing demand for more electricity, the implementation of proposed project with installed capacity of 10 MW contributes to partially meeting the shortage of power and energy in the State of Andhra Pradesh.

The hydroelectric project is conceived with a view to harness the irrigation discharges from the existing Somasila Dam in Nellore district of Andhra Pradesh, India. The project activity will generate 31 GWh annually and the energy produced will be sold to the state owned public entity Transmission Corporation of Andhra Pradesh Limited (APTRANSCO).

The project activity is expected to have several positive impacts for sustainable development. Some of the socio economic benefits that are expected due to implementation of the proposed small hydro project are:

- Employment to local poorer section and thereby reducing urban migration
- Availability of reliable and stable power in the local area.
- Promote infrastructure development in the project area and in it's vicinity
- Energy for domestic and commercial purpose and thereby reducing dependencies on forests
- Climate change mitigation, through renewable energy generation and reducing the demand for fossil fuel based power
- Contributing to the national electricity capacity through additional power generation

View of project participant about the project activity's contribution to Sustainable Development

Ministry of Environment and Forests (MoEF), Government of India, has stipulated the following indicators for sustainable development in the interim approval guidelines for CDM projects.

1. Social well-being
2. Economic-well being
3. Environmental well being and
4. Technological-well being

The project activity contributes to the above indicators in the following manner.

Social Well-Being

The small hydro project on Somasila dam is established in a rural area. The project activity results in alleviation of poverty by generating direct and indirect employment during construction of the project (about 250 workers both skilled and unskilled) as well as during operation (24 persons). The setting up of the hydro project will open up employment opportunities in the local area by making available clean hydro power especially for power intensive industries and to its population for their socio-economic upliftment as well as for improving their living conditions and life styles.

The project activity feeds the generated power to the grid, thereby energy availability and quality of power improves significantly in the local grid. The electrical energy produced shall be utilized for augmenting the energy supply in the local distribution network. By exporting the generated electricity through rural feeder the project activity supports the efforts of the utility in reducing the transmission and distribution losses. The stable supply of power in the region reduces drudgery in women, eases working hours, increase access to media, enhance general standard in their lives.

Economic Well Being:

The economy of the area depends mainly on Agriculture. The execution of the project is expected to give a boost to the general economy of the area in helping and developing the agricultural activities in this area.

Project proponents will mobilise investment to the region to an extent of about Rs. 519.19 millions which otherwise would not have happened in the absence of the project activity. This is a significant investment in a remote area.

This project activity results in extending the electric supply system to remote villages. Generation from small hydro project and feeding power to the nearby sub-station will greatly improve the much needed and assured quality power in the far-flung and isolated areas thereby opening up the economy, and giving a boost to agricultural and related activities, which is the core occupation of the people living around.

Environmental Well Being

The proposed project activity utilises hydro potential available for power generation, which otherwise is dominated by fossil fuels such as coal, lignite and gas, the project will not result in increase of GHG emissions and cause no negative impact on the environment both at local as well as at the global level. Further, the project activity does not result in degradation of any natural resources, health standards, etc. at the project area. The project will not cause any air, water, or noise pollution at the local level.

Technological Well Being:

The project will result in utilisation of environmentally safe and sound technologies in small scale hydroelectric power sector. Further the project demonstrates harnessing hydro potential from a reservoir, with seasonal flow, and encourages setting up such new projects in future. Hence, the project leads to the technological well being.

The above benefits due to the project activity ensure that the project would contribute to the sustainable development of the region.

A.3. Project participants:

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Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants	Whether Party involved wishes to be considered as project participant
India (Host)	Private Entity : **Balaji Energy Private Limited**	No

A.4. Technical description of the small-scale project activity:

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A.4.1. Location of the small-scale project activity:

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A.4.1.1. Host Party(ies):

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India.

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

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Andhra Pradesh

A.4.1.3. City/Town/Community etc:

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District: Nellore
Taluk: Atmakur
Village: Somasila

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

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The CDM project is a small hydroelectric project located in Somasila Village, Atmakur Taluk of Nellore District in the state of Andhra Pradesh. The project site is approachable from both the flanks of the Somasila Dam. On the left flank, the site is 89 km away from Nellore town on the road via Atmakur and Sangam village. It is 77 km away from Nellore Town on the road via Podalakur. The nearest railway station is at Nellore and the nearest airport is at Chennai (200 kms) in Tamil Nadu state. The project area is located in between longitude 79º15' to 79º20'E and latitude 14º25' to 14º29'N. Physical location of the project is marked in the maps below:

Fig : Map showing the Project Location in Nellore District in Andhra Pradesh

A.4.2. Type and category(ies) and technology of the small-scale project activity:

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Type & Category:

According to the Appendix B to the simplified modalities and procedures for small-scale CDM project activities the proposed project activity fall under the following type and category.

Project Type: Type I – Renewable Energy Projects
Category I.D: Renewable Electricity Generation for a grid

The project activity utilizes renewable hydro potential for power generation and exports the generated power to the grid. Since, the capacity of the CDM project is 10 MW, which is less than the qualifying capacity of 15 MW, the project activity is regarded as small-scale CDM project activity and UNFCCC indicative simplified modalities and procedures are applied.

Technical details of the project activity:

The project activity envisages generation of hydel power utilizing the head created at the existing Somasila irrigation dam. It is proposed to have a separate water conductor system for drawing the required quantum of water from Somasila Reservoir through an approach channel followed by a tunnel to the intake dam and release of water after power generation into the Pennar River.

The project comprises of two synchronous generators of capacity 5 MW each coupled to two units of Vertical Kaplan adjustable blade type turbines. Power is evacuated through 33/11 KV sub-stations at Somasila and Anantasagaram. Power evacuation is taking place from two sub-stations as the individual substation does not have the required load. The project installed capacity and data is as follows:

Brief technical details of the project design

Hydrology

Design Discharge	: 69.61 m^3/sec
Average Gross head	: 21.55 m
Net Design head	: 17 m

Energy

Gross energy generation	: 31.00 GWh
Annual export to the grid	: 30.69 GWh

Plant Equipment

Type of turbine	: Vertical Full Kaplan Type
Type of generator	: Brushless Synchronous
No. of generating units	: 2 Nos.
Capacity of each generating Unit	: 5 MW
Generation voltage	: 11 kV
Grid interfacing voltage	: 33 kV
Frequency	: 50 Hz

Demonstration for being with in the limits of SSC through out the crediting period:

The water and power studies carried out for this project demonstrates that the project activity will remain under the limits of SSC through out the crediting period. To determine the capacity of the power plant two important inputs are required, viz. the head available and discharge of water in the stream. The hydrology studies carried out have established the envisaged capacity of the plant. Based on the head and

discharge available for the SSC project, the optimum capacity of the power plant has been envisaged at 10 MW. This is below the 15 MW limit[1] of output-capacity for small-scale projects and therefore the project qualifies as a small-scale CDM project.

By keeping the above considerations, the project proponent declares that the project will be with in the limits of small scale through out the crediting period.

Technology transfer:

No technology transfer from other countries is involved in the project.

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

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The project activity uses the hydro potential available and the head created, because of the construction of Somasila Dam across river Penne. Since the project activity utilizes the renewable energy of the river water, for generation of electricity, the activity has zero emissions. Hence, the generation by the proposed project activity is non-GHG source and it is expected that the proportion of fossil fuel based generation in the grid will be reduced by the project activity leading to lesser carbon intensity in the grid.

Power generation is a single most significant activity that results in anthropogenic greenhouse gas emissions, especially carbon dioxide. The main reason for this is burning of carbon intensive fossil fuels such as coal, lignite, HFO, diesel and natural gas. The grid electricity in India today is clearly dominated by thermal generation, predominantly coal. The overall nationwide mix of thermal to hydro-electric power stands currently at around 83:17[2] (Source www.cea.nic.in as on March 2006).

This situation is peculiar to power deficit in India. In spite of the efforts of the planners of improving the hydro: thermal power ratio, it has deteriorated or remained stagnant. The major reason for this is the capital intensiveness and site specific difficulties in establishing hydroelectric projects. These projects also face difficulties in rehabilitation and resettlement of the project affected persons, which delay them and escalate their costs. The proposed small hydroelectric project does not face the above difficulties as it does not result in submergence and also does not generate greenhouse gases. The power generated and fed in the grid will help in replacing that many units, which would otherwise have been supplied by carbon intensive fuel sources on the margin. In the absence of the proposed project, either these carbon intensive sources (most probably the thermal power supplied by the central power PSUs) would have been despatched or the power requirement would have been left unmet.

Thus, it can be safely concluded that the proposed project would help in reducing GHG emissions by carbon intensive sources. In the absence of the project, these emission reductions would not have occurred.

In the year 2000, the Government of India has targeted a capacity addition of around 100,000 MW by the year 2012 and the expected total installed capacity in India by the end of 2012 will be around 200,000 MW. Renewable Energy based power generation could not make much contribution for capacity additions during the past plan periods in spite of various initiatives to develop the renewable energy sector. The national power policy announced by the government of India has given more thrust on

1 In accordance with the simplified modalities and procedures for small-scale CDM project activities (annex II to decision 21/CP.8 contained in document FCCC/CP/2002/7/Add.3):
http://cdm.unfccc.int/Reference/Documents/AnnexII/English/annexII.pdf

2 weblink:http://www.cea.nic.in/god/opm/Monthly_Generation_Report/18col_06_03.pdf

developing coal based power plants. There are plans by public sector companies like NTPC Ltd., as well as several private players to establish major thermal power plants considering predominantly coal, lignite as well as natural gas as main fuels. All these projects enjoy the advantages of favourable government policies, fuel efficiencies and established technologies. Section B.3 depicts the national & sectoral policies elaborately.

Therefore the proposed project activity contributes to the renewable energy development and adds to the clean energy mix in the connected energy system. In view of the above circumstances and various barriers in subsequent sections, it can be concluded that project activity reduces anthropogenic CO_2 emissions, which would not have occurred in the absence of the project activity.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

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The proposed 10 MW hydro project is to generate 31.00 GWh of electricity per year, and export 30.69 GWh /yr to the grid. The difference is due to auxiliary consumption and transmission losses up to feed-in point.

The expected emission reductions are calculated based on the net electricity sales and simple weighted average emission factor[3] of 786.68 tCO_2/GWh for the Southern Grid. The resulting emission reductions are 24,149 tCO_2 /yr. The year wise generation of emission reduction during the crediting period is shown below.

Table A.1: Annual estimation of Certified Emission Reductions (CERs)

Years	**Annual estimation of emission reductions in tones of CO_2 e**
2007	24,149
2008	24,149
2009	24,149
2010	24,149
2011	24,149
2012	24,149
2013	24,149
2014	24,149
2015	24,149
2016	24,149
2017	24,149
Total Emission reductions (tones of CO_2e)	**241,490**
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tones of CO_2 e)	**24,149**

In the above table the year 2007 corresponds to the period 01/08/2007 to 31/07/2008. The same holds for the subsequent years.

A.4.4. Public funding of the small-scale project activity:

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No public funding from parties included in Annex-I is involved in the project activity

[3] "CO_2 Baseline Database" published by CEA

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

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In accordance with Appendix C[4] of the Simplified Modalities and Procedures for Small-Scale CDM project activities "DETERMINING THE OCCURANCE OF DEBUNDLING", it can be confirmed that this project activity is not a debundled component of a larger CDM project.

No other CDM activity has been undertaken by the project participant, which is in the same project category and whose boundary is within 1 km of the project boundary of this project activity at the closest point.

SECTION B. Application of a baseline methodology:

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

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Project category: **Type I -** Renewable Energy Project

Reference: **AMS I.D**.- Grid connected Renewable Electricity Generation, Version 10 (23rd Dec, 06)

B.2 Project category applicable to the small-scale project activity:

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With a capacity of 10 MW, the proposed hydro project activity qualifies as small scale and therefore is eligible to use approved methodology AMS I.D. The application of the methodology is described below.

Selection and justification of calculation approach:

The boundary for determining the baseline emission factor is the Southern Region of India as defined by Central Electricity Authority (CEA).

The baseline emissions are calculated based on the net energy provided to the grid (in GWh /year), and an emission factor for the displaced grid electricity (in tCO_2 /GWh). AMS I.D requires that the baseline emission factor be calculated in a transparent and conservative manner, based on either

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002.

Or

(b) The weighted average emissions (in kg CO2equ/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

The baseline emission factor has been considered from the "**CO_2 Baseline Database**" published by CEA[5]. The emission factor published by CEA for the latest year 2004-05 is 786.68 tCO_2/GWh based on weighted average approach and 861 tCO_2/GWh based on combined margin approach. As required by the methodology, the project proponent, following conservative approach, has considered weighted average emission factor for determining the emission reductions.

Actual emission reductions will be calculated ex post based on latest available data at CEA website which is reliable and verifiable.

[4] http://cdm.unfccc.int/EB/Meetings/007/eb7ra07.pdf
[5] CO_2 Baseline Database, http://www.cea.nic.in/planning/c%20and%20e/Govertment%20of%20India%20website.htm

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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Justification for application of simplified methodology to the project activity

The capacity of the proposed project is 10 MW and the project activity is generation of electricity for a grid system using hydro potential. Hence, the type and category of the project activity meets the criteria specified under I.D. in Appendix B of the indicative simplified baseline and monitoring methodologies for small scale CDM project activities as well as those related to demonstration of additionality for small-scale activities (Attachment A to Appendix B).

National Policies and Circumstances

National policy on Coal, Lignite, Oil and Natural Gas

The Ministry of Power (MoP), Government of India has set an agenda of providing power for all by the year 2012. To meet the present national deficit of 8.4 %[6] and to achieve the above target, about 100,000 MW of new capacity needs to be added by the end of 2012 to the existing installed capacity of 126,089[7] MW. In line with the Five Year Plan system being followed by the Planning Commission of India, the MoP decided to add about 46,000 MW during the period 2002-2007 and about 61,000 MW during the period 2008-2012. Emphasis has been laid on setting up large pithead stations to avoid high costs associated with transporting high ash bearing Indian coal and over-straining the already stretched rail network.

To push forward the power sector reforms further, the Government of India has opened up the coal sector for private participation. Captive coal mining is allowed by the Ministry of Coal to facilitate coal mining by power generating units for their fuel needs. In addition, coal imports are allowed for power projects. This has significantly strengthened the preference of the private sector for coal-based mega power projects over other energy sources.

The Government of India has also opened oil and natural gas exploration for private sector participation. In the oil and natural gas sector, both central and private sector organisations are involved and already exploring the potential available in India. The discovery of new reserves is not significant enough to meet the increasing demand for natural gas. As yet the natural gas consumption is limited to a small extent and significant investments are required for natural gas infrastructure.

Hydropower Policy in India, Southern region and Andhra Pradesh

The grid electricity in India today is clearly dominated by thermal generation, predominantly coal. The overall nationwide mix of thermal to hydro-electric power stands currently at around 83:17[8] (Source www.cea.nic.in as on March 2006).

The National Policy on Hydropower Development provides for exploitation of untapped potential located in the Northern States and North Eastern States. MoP has developed appropriate strategies to fully exploit the country's hydro potential and accords high priority for its development. MoP has identified some of the potential sites for hydropower development. However, the focus of these initiatives is clearly on large and medium projects (table B.2) as shown below:

[6] CEA report as on 30th June 2006. www.cea.nic.in/planning/POWER SCENARIO AT A GLANCE/ index.htm
[7] CEA report as on 30th June 2006. www.cea.nic.in/planning/POWER SCENARIO AT A GLANCE/ index.htm
[8] weblink:http://www.cea.nic.in/god/opm/Monthly_Generation_Report/18col_06_03.pdf

Table B.2: Capacity Addition in Andhra Pradesh during 10th Plan (source: www.cea.nic.in)

Project Name	Type	Status	Installed Capacity (MW)	Capacity Addition During Xth Plan (MW)	Benefits Shares of state (MW)	Commissioned/ slipped during 2002-2007 (MW)	Last Unit Commissioning Date/ (Likely Date of Commissioning)
CENTRAL-SECTOR							
TALCHER II	T	S	2000.00	2000.00	425.00	COMM 2000.00	06.02.2005
RAMAGUNDAM III	T	S	500.00	500.00	146.00	COMM 500.00	31.08.2004
KAIGA U-3	N	S	220.00	220.00	62.00		(2006-2007)
SIMHADRI TPS	T	S	500.00	500.00	500.00	COMM 500.00	24.08.2002
	CENTRAL-SECTOR TOTAL:-			1133.00			
STATE-SECTOR							
JURALA PRIYA	H	C	234.60	78.20	78.20		(MARCH,2007)
SRISAILAM LBPH	H	S	900.00	450.00	450.00	COMM 450.00	04.09.2003
RAYALASEEMA II	T	S	420.00	420.00	420.00		(JULY,2006)
	STATE - SECTOR TOTAL:-			948.20			
PRIVATE-SECTOR							
RAMAGUNDEM EXT*	T	C	520.00	520.00	520.00	SLIP 520.00	(12TH PLAN)
PEDDAPURAM CC $	G	S	78.00	78.00	78.00	COMM 78.00	12.09.2002
JEGRUPADU CCPPX	G	N	220.00	220.00	220.00	COMM 220.00	11.11.2005
GAUTAMI CCGT *	G	N	464.00	464.00	464.00		(JULY,2006)
VEMAGIRI ST	G	C	137.00	137.00	137.00	COMM 137.00	08.06.2006
VEMAGIRI GT *	G	C	233.00	233.00	233.00	COMM 233.00	13.01.2006
KONASEEMA CCGT*	G	N	445.00	445.00	445.00		(AUG.,2006)
	PRIVATE-SECTOR TOTAL:-			2097.00			
	GRAND-TOTAL:-			4178.20			

As per planning commission target capacity addition in the southern regional grid, which constitutes five states including Andhra Pradesh during 10th Plan, the hydro power plant constitutes a mere 1158.2 MW compared to 5998 MW of thermal plant (table B.3).

Table B.3: Capacity Addition in Southern Region during 10th Plan (source: www.cea.nic.in)

Sector	Hydro	Thermal				Nuclear	Wind	Total
		Coal	Gas	Diesel	Total			
STATE	1158.2	1130.0	294.0	0.0	1424.0	0.0	0.0	2582.2
PRIVATE	0.0	770.0	1776.0	108.0	2654.0	0.0	0.0	2654.0
CENTRAL	0.0	1920.0	0.0	0.0	1920.0	220.0	0.0	2140.0
TOTAL	1158.2	3820.0	2070.0	108.0	5998.0	220.0	0.0	7376.2

In the light of the national and sectoral policies/ circumstances, it can be concluded that the electricity generation, in India is carbon intensive, and in future it is likely to become even more carbon intensive, based on fossil fuels. Therefore this renewable small scale hydro power project will help in reducing the anthropogenic emissions of anthropogenic green house gases to some extent.

Barrier Analysis

Under UNFCCC simplified modalities, project activity should seek to establish additionality of the project activity as per Attachment A to Appendix B, which lists various barriers, out of which at least one barrier shall be identified due to which the project would not have occurred any way. Project participants identified the following barriers for the proposed project activity.

Prevailing Practice:

As per the statistics available from NEDCAP the state nodal agency for sanction of approvals for setting up of small hydro projects, the project activity is the first dam based small hydro project in the state of Andhra Pradesh. All the other projects implemented are canal based projects except very few examples of reservoir based and run of the river schemes. As a dam based project the project had to face important barriers which are not typical to canal based projects.

Normally in a dam based project pen stocks are part of sluice gates to avoid tunnel construction. Additional expenditure incurred due to non provision of penstocks is about Rs. 80 million. In respect of the project activity as no provision was made, the project proponent had to provide water conductor system, surge tank, pen stock etc at an extra cost as indicated above. This way the project is unique and there is no comparison for this project from any of the existing hydro power plants in Andhra Pradesh.

Investment Barrier:

Originally the project is envisaged to install the turbines at the down stream side of the Somasila dam in the river bed itself and connecting the generating machines by laying penstocks and connecting them to the river vents provided in the piers number 17 & 18. These vents in the piers are provided to release the water for the ayacut (irrigation) requirements of Sangam weir.

The project proponent has planned the project on the assumption that the vents provided in the piers can be utilized for the project to avoid water conductor system and the associated civil works thus reducing project investment. When the developer submitted the lay out drawings for approval, the Chief Engineer, Central Designs Organization of Irrigation department raised an objection that the vents provided at dam blocks 17 and 18 cannot be converted to power blocks meant for power generation. Letter from Secretary to Government, Irrigation department is furnished for verification. The whole concept that the developer had in mind became not useful and project proponent was forced to find out alternate water conductor system. The final water lay out system as proposed consisted of an intake channel from the reservoir, construction of intake structure with gates, a tunnel down stream of intake channel, intake structure at the exit of the tunnel, surge shafts at a suitable location and erection of pen stocks to connect to the turbines.

Further, the project construction has to be done in non irrigation season. In addition a coffer dam & a bridge also need to be constructed. The above changes in the project lay out may delay the execution of the project and could contribute to additional investment in the project activity. Taking this into consideration the project proponent envisaged that the project needs extra investment compared to other canal based or reservoir based small hydro power projects.

SAFETY REQUIREMENTS

During the design of the power project the project proponent is required to take adequate care of the safety of the dam. For this, the proponent had to consult with National Institute of Rock Mechanism, who is specialist in monitoring of blasting for taking necessary precautions on dam safety. This extra safety measure leads to additional investment from the promoter.

LONG TRNASMISSION SYSTEM

Originally APTRANSCO has agreed for evacuation of power from the Somasila substation. Later the proponent has been directed to evacuate the power through 33/11 KV sub-stations located at Somasila and Anantasagaram. The Somasila substation is located at 2 km away from the project site whereas the Anantasagaram substation is located at a distance of 16 km away from the project site. This action has resulted in laying transmission lines, providing two switch yards etc resulting in an extra expenditure.

INADEQUATE FUNDING

The project has not been sanctioned required funds for implementation of the project. The project proponent has submitted a request to IREDA for sanction of term loan based on a total project cost of Rs. 519.19 million. However IREDA has firmed up the cost at Rs 396.2 million and sanctioned a term loan of Rs 273.30 million for the project activity, through their over conservative approach, which has affecting the project implementation. However subsequently it is proved that funds were not sufficient and due to lack of sufficient funding the project proponent had to defer important civil works such as lining of tunnels, lining of tail race channel, construction of out fall structure at the joining of tail race water in the river etc. Irrigation department while giving their clearance have put conditions with regard to construction of these civil works. All these civil works are expected to cost a further sum of Rs.50 million. These civil works have an impact on the power generation and might reduce the head available, thus affecting the power generation. Even Alternate Hydro Energy Centre, IIT, Roorkee has also confirmed the view of the project proponent with respect to the cost of civil works.

INVESTMENT ANALYSIS

An IRR analysis has been prepared for the project activity. The IRR worked out to 13.81 % with out CDM Revenue based on the following assumptions.

1. Capital Cost of the Project	Rs. 519.19 million
2. Gross Generation	31.00 GWh
3. Auxiliary Consumption & Grid Outages	1.00%
4. Net Power Export to the Grid	30.69 GWh
5. Tariff Rs / KWh with an yearly escalation of 5%	Rs. 3.49
6. O & M Costs (on Civil & Mechanical)	1.50 % with an yearly escalation at 5 %
7. Book Depreciation (Straigt Line Mehod) /annum	Rs.23.36 Million
8. Income Tax Holiday / Years (Exemption of 100 % of profits for the first five years, and 30 % for balance five years)	10
9. Interest on Term Loan /p.a	14 %
10. Interest Subsidy	2 %
11. CERs Rate (Euro / Ton co2e)	10

The IRR improves to 16.95% considering CDM revenue against the bench mark return of Rs. 16.44%. Thus CDM revenue is significant for this project to make it attractive for investment and also to over come some of the hardships mentioned above.

SENSITIVITY ANALYSIS

A sensitivity analysis is prepared for the following scenarios and the resultant IRR is shown in the table below.

1. Reduction in tariff by 10 %, and
2. Increase in power generation by 20 % and decrease in tariff by 20 %

Improvement in power generation is considered at 20% along with reduction in tariff at 20% on the assumption that water flows may improve in the Pennar river system due to any factors and at the same time there is also certainty of reduction in power tariff as the developments indicate.

Details	IRR (W/O GHG) %	IRR (With GHG)%
Normal	13.81	16.95
Reduction in tariff by 10 %	10.89	14.11
Increase in Generation by 20 % and reduction in tariff by 20%	12.65	16.45

As the reality showed that ultimately the tariff issues are yet to be decided. The utility has not been honouring the directions of either the Honourable High Court of Andhra Pradesh or that of the Appellate Tribunal. The sensitivity analysis also indicates the significance of CDM revenue for the project activity.

Institutional Barrier:

The project faces institutional barrier before and during the implementation of the project, mainly with respect to the determination of the tariff for electricity exported. The following evidence underlines the relevance of this barrier:

The project was envisaged at a time when the state utility was offering tariff based on the guidelines of Ministry of Non-conventional Energy Sources (MNES). The project proponent entered into a Power Purchase Agreement (PPA) with the APTRANSCO in October, 2000, according to which the company shall be paid the tariff for the energy exported to APTRANSCO at Rs. 2.25 per unit with escalation at 5% per anum with 1994-95 as the base year, which was fixed by MNES for small hydro electric project.

However uncertainty prevailed with respect to tariff due to power reforms taking place in the state of Andhra Pradesh even in the project planning stage. One of the clauses in the Power Purchase Agreement stipulates that the specified tariff is payable up to the year 2003-04 and beyond the year 2003-2004 the purchase by AP Transco will be decided by the A.P Electricity Regulatory Commission. As predicted, Electricity Regulatory Commission of Andhra Pradesh brought several changes in the tariff policies of the State such as third party sale of power was banned, the tariff was reduced with effect from 01/04/2004 and a ceiling was fixed on plant load factor for eligibility of normal tariff. As per the revised tariff the hydro power project is eligible for only Rs.2.69 per kWh with progressive reduction against the envisaged tariff of Rs.3.49 per kWh (for the year 2004-05). This decision has seriously affected the project viability. The project proponent had to seek legal remedy against the unjustified orders of the Regulatory Commission which is still pending.

In view of the above barriers it can be concluded that the proposed project activity is additional and not the same as the baseline scenario. CDM revenues will help the project proponent to compensate some of the hardships caused by the various barriers indicated above.

Early Consideration of CDM:

The project proponent has considered CDM as viable alternative to mitigate the barriers mentioned above. The proponent has heard from various sections like Print Media, Electronic Media etc that several tenders were being floated by European countries for purchase of emission reductions from renewable energy projects from developing countries. In one of their board meeting held on 16th January, 2002, they have discussed about the CDM benefits for the project and have adopted a resolution for the same.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

>>

Project boundary specified in the Appendix B of simplified modalities and procedures is that encompasses the physical, geographical site of the renewable generation source.

For the project activity under consideration, the project boundary encompasses the approach channel, trash rack structure, Intake dam, Penstocks, Powerhouse, Power evacuation system and tailrace channel.

B.5. Details of the baseline and its development:

>>

The baseline for the project activity is constructed according to clause 9.b of AMS ID, Version 10. i.e. weighted average emissions of the current generation mix (in $kgCO_2e/kWh$), applicable for Type I.D CDM project activities, as contained in Appendix B of simplified modalities and procedures for small scale CDM project activities.

Date of completion of the baseline: 6th October 2006
Name of the person / entity determining the baseline: Zenith Energy Services (P) Limited, Hyderabad.

Contact information of the above entity furnished below:

Organization:	Zenith Energy Services (P) Ltd
Street/P.O. Box, Building:	10-5-6/B, My Home Plaza, Masabtank,
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500028
Country:	India
Telephone:	+91- 40- 2337 6630, 2337 6631
FAX:	+91- 40- 2332 2517
E-Mail:	zenith@zenithenergy.com
URL:	www.zenithenergy.com
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Reddy
Middle Name:	Mohan
First Name:	Attipalli
Mobile	+91- 9849408485
Direct Fax	+91- 40- 2332 2517
Direct Telephone	+91- 40- 2332 5803
Personal E-Mail	mohan@zenithenergy.com

The above entity is not a project participant.

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

>>

C.1.1. Starting date of the small-scale project activity:

>>

01/11/2002

C.1.2. Expected operational lifetime of the small-scale project activity:

>>

30 Years

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

>>

C.2.1. Renewable crediting period:

>>

Not Chosen

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

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>>

01/08/2007

C.2.2.2. Length:

>>

10 Years

SECTION D. Application of a monitoring methodology and plan:

>>

D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

>>

Name of Methodology: ***Metering the Electricity Generated by the Renewable Technology***

Reference: **Clause 13 of AMS ID Appendix B** of simplified modalities and Procedures for small-scale CDM project activities.

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

>>

The project activity is generation of electricity using hydro potential and exporting the same to the grid system, which is also fed by other fuel sources such as fossil and non-fossil types. The project qualifies for AMS I.D and the monitoring provisions contained therein.

Emission reductions due to the project activity are considered to be equivalent to the emissions avoided in the baseline scenario by displacing the grid electricity. Emission reductions are related to the electricity exported by the project and the actual generation mix in the grid system. The baseline emission factor is adopted from the "CO_2 Baseline Database" based on the weighted average emissions of the current generation mix for the fiscal year 2004/05 and will be updated ex-post during the crediting period. The data to be monitored to ascertain emission reductions out of the project activity is to measure the quantum of electricity generated through energy meters and the emission factor each year based on data available form CEA. With this information, a reliable estimate of the quantum of emission reduction can be made.

D.3 Data to be monitored:

>>

The following data is to be monitored to ascertain project emissions and emission reductions.

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
D.3.1	Power	Gross Generation	kWh	m	Continuous	100%	Electronic and Paper	Crediting period plus 2 years	Meter is Calibrated and Regularly inspected by APTRANSCO
D.3.2	Power	Auxiliary Consumption	kWh	m	Continuous	100%	Electronic and Paper	Crediting period plus 2 years	Meter is Calibrated and Regularly inspected by APTRANSCO
D.3.3	Power	Power Import	kWh	m	Continuous	100%	Electronic and Paper	Crediting period plus 2 years	Meter is Calibrated and Regularly inspected by APTRANSCO
D.3.4	Power	Power Export	kWh*	m	Continuous	100%	Electronic and Paper	Crediting period plus 2 years	Meter is Calibrated and Regularly inspected by APTRANSCO
D.3.5	Emission Factor	Grid Emission Factor (EF)	tCO_2/ GWh	------	------	100%	Electronic and Paper	Crediting period plus 2 years	Data is based on "CO_2 Baseline Database" published by CEA.

* The data variable will be monitored for both Somasila and Anantasagaram Substation

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

>>

Data	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary
D.3.1 & D.3.2	Low	This data item will be recorded at the project site which is under the control of project proponent. The energy generated and consumed is measured using calibrated meters and recorded by project proponent. Records of measurements will be used for calculating net export to grid.
D.3.3	Low	This data will be recorded at the project site and the energy imported is measured using APTRANSCO calibrated meter. Records of measurements will be used for calculating net export to grid. Sales bills/receipts may be compared as an alternative proof of the power imported from APTRANSCO grid.
D.3.4	Low	This data item will be recorded at the grid substation, which is under the control of APTRANSCO. The energy measured using calibrated meters and recorded at APTRANSCO substation will be monitored. Records of measurements will be used for verification of emissions reductions. Sales bills / receipts may be compared as an alternative proof of the power exported to the grid
D.3.5	Low	Based on "CO_2 Baseline Database" published by CEA. The project participant has no influence on quality control procedures.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

>>

The management structure proposed for monitoring of emission reductions due to the project activity mainly comprises a GHG audit team / committee and authorized to perform various functions such as measuring, recording, storage of measured data and reporting to the project participants. The outcomes of the committee, in the form of GHG audit reports, are being monitored periodically. The committee comprised representatives of the project participant and other experts as decided from time to time. It was proposed that whenever required an external independent GHG auditors would be deputed for the monitoring activities**.**

Project Management

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data rests with the Board of Directors. The Board may delegate the same to a competent person identified for the purpose. The identified person will be the in charge of GHG monitoring activities and necessary reports will be submitted to the management or its Committee for review.

Monitoring Requirements

The monitoring plan includes monitoring of single parameter i.e. the energy fed to the APTRANSCO grid system. Emission reductions resulted from the project activity will be calculated using the energy fed in accordance with the calculations illustrated in Section E of the PDD. Emission reductions generated by the project shall be monitored at regular intervals.

Monitoring equipment comprises of energy meters, which will monitor the energy fed by the plant to APTRANSCO grid system by the proposed project. In accordance with the PPA, project proponents have to install two energy meters one is main meter and the other is check meter. Project proponent will calibrate both the meters according to the procedures laid down in PPA. Project proponent will appoint a Designated Operational Entity (DOE) for verification of emission reductions and leakages resulted by the project activity at regular intervals.

Methodology adopted for determining base line emission factor is the weighted average emissions of the generating mix in the Southern grid system, which will represent the intensity of carbon emissions of the grid system. The baseline emission factor is adopted from the "CO_2 Baseline Database" published by CEA for the latest available year for the southern grid and the same is used for the future projection and will be reviewed each year based on data published by CEA. The monitored data will be presented to the verification agency or DOE to whom verification of emission reductions is assigned.

Leakage Monitoring

The proposed 10 MW hydroelectric project is renewable energy type and it utilizes the discharges actually let down for downstream utilization to meet the irrigation demands of Pennar delta and Kavali canal system and it does not involve any GHG emission. No leakage is involved in the proposed activity.

Data Recording and Storage

The net energy fed to the grid system by the project activity will be recorded by project proponents using either of the two meters (main meter and check meter) in the presence of the representative of APTRANSCO. Representatives of both the project proponent and APTRANSCO will sign the document which will contain all details such as the equipment data, calibration status, previous reading, current reading, export, import, net billable units, date and time of recording etc. This document will be used as a basic document for monitoring and verification of the net energy exported to the grid. APTRANSCO will pay to project proponents based on this document.

The above document will be preserved for verification of emission reductions from the project, in safe storage. Supporting documents such as receipts of payments released by APTRANSCO will also be preserved in safe storage for later verification by an independent third party. The period of storage will be of 2 years after the end of crediting period or till the last issuance of CERs for the project activity whichever occurs later.

D.6. Name of person/entity determining the monitoring methodology:

>>

The contact information of the entity, which has determined the monitoring methodology, is given below

Organization:	Zenith Energy Services (P) Ltd
Street/P.O. Box, Building:	10-5-6/B, My Home Plaza, Masabtank,
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500028
Country:	India
Telephone:	+91- 40- 2337 6630, 2337 6631
FAX:	+91- 40- 2332 2517
E-Mail:	zenith@zenithenergy.com
URL:	www.zenithenergy.com
Represented by:	

Title:	Director
Salutation:	Mr.
Last Name:	Reddy
Middle Name:	Mohan
First Name:	Attipalli
Mobile	+91- 9849408485
Direct Fax	+91- 40- 2332 2517
Direct Telephone	+91- 40- 2332 5803
Personal Email	mohan@zenithenergy.com

The above entity is not a project participant.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

>>

E.1.1 Selected formulae as provided in appendix B:

>>

AMS I.D does not provide explicit formulae for the calculation of emission reductions. Section E.1.2 describes the variables and formulae used for this project activity.

E.1.2 Description of formulae when not provided in appendix B:

>>

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

>>

The proposed hydroelectric project is zero CO_2 emission; no specific formulae are specified for the applicable project category.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

>>

No leakage is applicable for the project activity, hence, no formulae are applicable.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

>>

The sum of E.1.2.1 and E.1.2.2 is Zero.

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

>>

As explained in Section B.2, the baseline for the project activity is kWh produced by the hydroelectric project multiplied by an emission co-efficient calculated in a transparent and conservative manner as the weighted average emissions (in $kgCO_2/kWh$) of the current generation mix.

The emission reductions for a given year are calculated as baseline emissions minus the project emissions and leakage:

$$\mathbf{ER_y = BE_y – PE_y - L_y}$$

Since the project emissions (PE_y) as well as the leakage (L_y) are zero, the emission reductions are equal to the baseline emissions. These are calculated based on the monitored net amount of electricity supplied to the grid, and the baseline emission factor. The latter is monitored and hence determined ex post.

$ER_y = BE_y = EF_y \times EG_y$

Where,

ER_y - Emission reductions in the y^{th} year

BE_y - Baseline emissions in the y^{th} year

EF_y - Baseline emission factor for the project grid

EG_y - Power Export to the Grid in the y^{th} year.

Values obtained while applying the above formulae are provided in the following table.

Sl.No	Year	Gross energy (GWh)	Auxilary Consumtion (GWh)	Export for Emission Reductions (GWh)	Emission Factor (t CO2/Gwh)	Baseline Emissions (t CO2)
1	2007	31.00	0.31	30.69	786.86	24,149
2	2008	31.00	0.31	30.69	786.86	24,149
3	2009	31.00	0.31	30.69	786.86	24,149
4	2010	31.00	0.31	30.69	786.86	24,149
5	2011	31.00	0.31	30.69	786.86	24,149
6	2012	31.00	0.31	30.69	786.86	24,149
7	2013	31.00	0.31	30.69	786.86	24,149
8	2014	31.00	0.31	30.69	786.86	24,149
9	2015	31.00	0.31	30.69	786.86	24,149
10	2016	31.00	0.31	30.69	786.86	24,149
Total Emission Reducitons						**241,490**

In the above table the year 2007 corresponds to the period 1/04/2007 to 31/03/2008. The same holds for the subsequent years.

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

>>

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Baseline emissions, **E.1.2.4**, tCO_2	24,149	24,149	24,149	24,149	24,149	24,149	24,149	24,149	24,149	24,149
Project emissions, **E.1.2.3**, tCO_2	0	0	0	0	0	0	0	0	0	0
Emissions Reductions, **E.1.2.4 – E.1.2.3,** tCO_2	24,149	24,149	24,149	24,149	24,149	24,149	24,149	24,149	24,149	24,149

E.2 Table providing values obtained when applying formulae above:

>>

Years	Annual estimation of emission reductions in tones of CO_2 e
2007	24,149
2008	24,149
2009	24,149
2010	24,149
2011	24,149
2012	24,149
2013	24,149
2014	24,149
2015	24,149
2016	24,149
2017	24,149
Total Emission reductions (tones of CO_2e)	**241,490**
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tones of CO_2 e)	**24,149**

In the above table the year 2007 corresponds to the period 1/08/2007 to 31/07/2008. The same holds for the subsequent years.

SECTION F.: Environmental impacts:

F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>>

As per the prevailing regulations of the Host Party (represented by the Ministry of Environment and Forests, Govt. of India and also the line ministry for environmental issues in India), the project activity need not conduct any environmental impact assessment.

The project activity does not result in any negative impacts on the socio economic environment of the region. Displacement of local population, disturbance in the local eco systems, deforestation etc., are not involved.

Hence the project does not cause any impacts on the environment or socio economic situation in the region.

SECTION G. Stakeholders' comments:

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

>>

No specific public consultation / participation requirements are specified in Indian statutes for setting up of small-scale industries. However, there are certain procedural requirements, which every project investor needs to follow before implementing any project.

Before implementing any project, project investors / developers need to identify the stakeholders, prepare necessary documents, approach the identified stakeholders directly and obtain required clearances / approvals. The stakeholders after review of documents and investment profile, will accord approvals / licences or send comments in writing to project investors for further clarifications / corrections. In case they are not satisfied with the project design or they feel that the project impacts any of the local environment / social / economical environments, they will not issue clearances / approvals and stop the implementation of the project.

The project participants, as required for setting up the project, have identified the following stakeholders.

a) Local populace, represented by the Village Panchayat
b) The Non-conventional Energy Development Corporation of Andhra Pradesh Ltd. (NEDCAP)
c) Andhra Pradesh State Electricity Board (APSEB)
d) Transmission Corporation of Andhra Pradesh Ltd. (APTRANSCO)
e) Andhra Pradesh Electricity Regulatory Commission (APERC)
f) Andhra Pradesh State Pollution Control Board (APPCB)
g) Ministry of Non-conventional Energy Sources, Govt. of India (MNES)
h) Irrigation department, Government of Andhra Pradesh

The project participants prepared necessary documentation before implementation of the project activity and approached the above stakeholders individually. The project participants have received no negative comments, which is evident from the following clearances and approvals.

1. Transmission Corporation of Andhra Pradesh Ltd. (APTRANSCO) and the Balaji Energy Pvt. Ltd. have executed a Power Purchase Agreement on 31st of January, 2005.
2. NEDCAP has accorded permission for setting up the project on 11th of April, 2000 vide letter no **NEDCAP/MHS/82/101/99-2000.**
3. Andhra Pradesh State Electricity Board (APSEB) has given their consent for setting up the project via letter no B.P (Proj-IPC) Ms. No.188 on 29.12.1994
4. Irrigation Department has approved the scheme on 12th of May, 1999 via letter no **Lr.No.DCE(MI)/0T2-T3/Misc.98**
5. The Andhra Pradesh Pollution Control Board has given the consent for the project via order no: **190/PCB/C.Estt/RO-NEL/AEE-N/99/3622** on 2nd of November, 1999
6. The local village panchayat of Somasila has given NOC for the project on 12/04/1999.

G.2. Summary of the comments received:

>>
No comments are received on the project.

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

>>

No comments received and hence no action report is applicable.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Balaji Energy Private Ltd
Street/P.O.Box:	Aravind Nagar Colony, Domalguda
Building:	1-2-234/13/37 & 38, 2nd Floor
City:	Hyderabad
State/Region:	Andhra Pradesh
Postcode/ZIP:	500 029
Country:	India
Telephone:	+91 040 27606449, +91 040 55501776
Fax:	+91 040 27603280
E-Mail:	
URL:	
Title:	Director
Salutation:	Mr.
Last Name:	Reddy
Middle Name:	Venkata Rami
First Name:	L
Mobile:	+91 94407 41410
Direct FAX:	+91 040 27603280
Direct tel:	+91 040 27606449, +91 040 55501776
Personal E-Mail:	--

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from the parties included in Annex -I is involved in the project activity.

Annex 3

References for Base Line Data

The methodology adopted for the calculation of the baseline is 'Simple weighted average of the current generation mix". The baseline emission factor has been adopted from the "CO2 Baseline Database" published by CEA.
(http://www.cea.nic.in/planning/c%20and%20e/Govertment%20of%20India%20website.htm)

References for completing PDD

1. Website of United Nations Framework Convention on Climate Change (UNFCCC), http://unfccc.int
2. UNFCCC document: Clean Development Mechanism, Simplified Project Design Document For Small Scale Project Activities (SSC-PDD), Version 02
3. UNFCCC document: Simplified modalities and procedures for small–scale clean development mechanism project activities
4. UNFCCC document: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories, Version 10, 23rd December 2006
5. Detailed project report

Annex 4

Abbreviations

APGENCO	Andhra Pradesh Generation Corporation
APERC	Andhra Pradesh Electricity Regulatory Commission
APPCB	Andhra Pradesh Pollution Control Board
APTRANSCO	Andhra Pradesh Power Transmission Corporation
CEA	Central Electricity Authority
CO_2	Carbon dioxide
EIA	Environment Impact Assessment
GHG	Greenhouse gas
Gwh	Giga watt hour
IPCC	Inter Governmental Panel On Climate Change
IREDA	Indian Renewable Energy Development Association
kWh	Kilo watt hour
MNES	Ministry of Non Conventional Energy Sources
MW	Mega watt
NEDCAP	Non-conventional Energy Development Corporation of Andhra Pradesh
PDD	Project design document
UNFCCC	United Nations Framework Convention on Climate Change