



Voluntary Carbon Standard 2007.1  
Validation Report Template

**19 November 2007**

Validation Report:

<b>Name of Verification company:</b>	<b>Date of the issue:</b>
SIRIM QAS International Sdn. Bhd.	01 <sup>st</sup> June 2011
<b>Report Title:</b>	<b>Approved by:</b>
VCS Validation Report (SQAS-VCS-EE12880090) for "Natural Gas Based Combined Cycle Power Generation, at Kothapeta, East Godavari, Andhra Pradesh, India"	Parama Iswara Subramaniam VVB Authorised Representative
<b>Client:</b>	<b>Project Title:</b>
Konaseema Gas Power Limited	"Natural Gas Based Combined Cycle Power Generation, at Kothapeta, East Godavari, Andhra Pradesh, India" Version: 02.1 Date: 24/05/2011

**Summary:**

Konaseema Gas Power Ltd (KGPL), India has engaged SIRIM QAS International Sdn Bhd to undertake the validation of the project “Natural Gas Based Combined Cycle Power Generation, at Kothapeta, East Godavari, Andhra Pradesh, India” under the Voluntary Carbon Standard (VCS) 2007.1. The purpose of the validation is to perform an independent, third party assessment of whether the project activity confirms to the qualification criteria set in the VCS 2007.1 standard and related requirements to attain real, measurable, additional, and permanent emission reduction. The validation exercise was not meant to provide any consulting to the project participants. However, the stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

The validation consisted of three phases;

i) a document review of the project documents and preparation of validation protocol, ii) on-site visit to the project activity and interviews with the project developer and the project consultant, and, iii) resolution of outstanding issues and the issuance of final validation report and validation opinion

The project activity involves construction and operation of a new, Greenfield 445 MW natural gas based combined cycle power plant near Devarapalli village, Andhra Pradesh, India for supply to the grid. The main purpose of the project activity is to generate electricity through less GHG intensive fuel, such as natural gas (NG), that displaces electricity from an electricity distribution system (Southern Grid) dominated by fossil fuel fired generating unit. The project activity will displace approximately 3313 GWh of power annually (and reduce 1,358,857 tonnes of CO<sub>2</sub>) by means of its less carbon intensive power annually to the power deficit, carbon intensive Southern Grid.

The validation process, from contract review to the issuance of validation report and validation opinion was conducted in accordance with SIRIM QAS Intl.’s internal procedures. The first output of the validation process was a list of corrective action requests and clarification requests (CAR and CL) which is presented in Appendix II of this report. As a result of these findings, the PDD was revised by the client.

In summary, it is the opinion of SIRIM QAS Intl. that the proposed VCS project activity has correctly applied the baseline and monitoring methodology (AM0029 version 03) for the project activity and meets the relevant VCS 2007.1 requirements. Total GHG emission reductions by the project is 1,358,857 tCO<sub>2e</sub> per annum and the estimated GHG reductions from the project would be real, measurable, permanent and additional.

Work carried out by:	Number of pages:
Mr. Akmar Hisham Saat Mr. Sai Prasad Dr. G.Vishnu	65

**Abbreviations**

APDISCOM	Andhra Pradesh Distribution Company
APTRANSCO	Andhra Pradesh Transmission Company
BCM	Billion Cubic Metres
CAR	Corrective Action Request
CCPP	Combined Cycle Power Plant
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission.
CL	Clarification Request
CO <sub>2</sub>	Carbon Dioxide
CO <sub>2</sub> /MU	Carbon dioxide / Million Units
CO <sub>2e</sub>	Carbon Dioxide Equivalent
DOE	Designated Operational Entity
DPR	Detailed Project Report
EF	Emission Factor
EIA	Environmental Impact Assessment
EPC	Erection Procurement & Commissioning
GAIL	Gas Authority of India Limited
GHG	Greenhouse gas(es)
GSHR	Gross Station Heat Rate
JMR	Joint Meter Reading
KGPL	Konaseema Gas Power Ltd.
MCM	Million Cubic Metres
MCMD	Million Cubic Metres per Day
MoEF	Ministry of Environment and Forests
MoPNG	Ministry of Petroleum and Natural Gas
MP	Monitoring Plan
NG	Natural Gas
O & M	Operation and Management
PLF	Plant Load Factor
PP	Project Participant
RIL	Reliance Industries Limited
PPA	Power Purchase Agreement
QA/QC	Quality Assurance/Quality Control
SCM/day	Standard Cubic Meter / day
SIRIM QAS Intl.	SIRIM QAS International Sdn Bhd
SPV	Special Purpose Vehicle
tCH <sub>4</sub> /PJ	Tonnes of Methane/ Peta Joules
UNFCCC	United Nations Framework Convention on Climate Change

VCS                      Verified Carbon Standard  
VCU                      Verified Carbon Unit

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## 1 Introduction

Konaseema Gas Power Ltd (KGPL), (hereinafter referred to as the 'Project Proponent') has contracted SIRIM QAS Intl. to perform the validation of their project "Natural Gas Based Combined Cycle Power Generation, at Kothapeta, East Godavari, Andhra Pradesh, India" (hereinafter referred to as the project activity) under the Voluntary Carbon Standard (VCS) 2007.1 standard. This report describes the validation work undertaken.

### 1.1 Objective

The purpose of the validation is to perform an independent, third party assessment of whether the project activity confirms to the qualification criteria set in the VCS 2001.1 standard to attain real, measurable, additional, and permanent emission reduction.

The validation opinion is a written assurance that the project complies with all the applicable VCS requirements and has the ability to generate the emission reductions stated over the project's crediting period.

### 1.2 Scope and Criteria

The validation scope includes an independent and objective review of the Project VCS project description (PD), the project's baseline study, monitoring plan and other relevant documents. Specifically, the objectives of the validation work are:

- To verify that the project activity meets the requirements of VCS 2007.1 standard including additionality, proof of title and compliance with local laws.
- To assess whether the baseline and monitoring plan are in conformance with the methodology applied from the VCS approved GHG program.
- To certify that the information presented are complete, consistent, transparent and free of material error.

The PD (/1/ and /2/ and /2.1/ of Appendix 1) was reviewed against VCS 2007.1 standard and the VCS program guidelines (/3/ of Appendix 1) and the applied CDM methodology, AM0029 version 03 (/4/ of Appendix 1). SIRIM QAS Intl. has performed the validation based on a risk based approach focusing mainly on the significant risks to meet the qualification criteria and the ability to generate VCUs.

The work carried out by SIRIM QAS Intl. is free from any conflict of interest.

### 1.3 VCS project Description

The project activity is Phase-I grid connected 445 MW natural gas based Combined Cycle Power Plant (CCPP). The power plant comprises of 2 x 140 MW natural gas-run turbines, two heat recovery steam generators and a 165 MW steam turbine. It is a green field project developed by Konaseema Gas Power Ltd, located at East Godavari district, Andhra Pradesh, India.

The generated power will be exported to the Andhra Pradesh power grid (part of the Southern Grid of India) and this is ensured by the Power Purchase Agreement (PPA) signed with State government owned Andhra Pradesh Transmission Corporation of India Ltd. (APTRANSCO). The project activity will meet the base load requirement of the Southern Grid.

The sold energy displaces an equivalent amount of energy from the fossil fuel dominated Southern Grid contributing significantly in avoidance of greenhouse gases emission.

### 1.4 Level of assurance

In line with VCS 2007.1 requirements and as per ISO 14064-3:2006 para A.2.3.2, a reasonable level of assurance has been followed for the validation of the project. Based on the desired level of accuracy SIRIM QAS Intl. has established an internal quality control process and assures that the information given in the PD is materially correct and is a fair representation of the of the actual project details, and is prepared in accordance with the VCS requirements and the applied CDM methodology for information pertaining to additionality, GHG quantification, monitoring and reporting.

The validation report is carried out as per this requirement and details are presented in the validation statement in section 4 below:

## 2 Methodology

The SIRIM QAS Intl.'s validation process consists of the following phases:

- A document review of the project description documents and preparation of validation protocol;
- On-site visit to the project activity and interviews with project developer, project consultant; and relevant stakeholders
- Resolution of outstanding issues and the issuance of final validation report and opinion

In order to ensure transparency, a validation protocol was customised for the project according to the VCS 2007.1 guidelines. The protocol describes criteria (requirements), means of verification, results from the validating and how the identified criteria, have been met in a transparent manner. The validation protocol serves the following purposes :

- it organizes, details and clarifies the requirements of a VCS project is expected to meet;

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- it ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of Appendix II, where findings established during the validation were classified as non-fulfilment of validation protocol criteria or where risks to the fulfilment of project objectives were identified.

Corrective Action Request (CAR) was issued, where:

- mistakes have been made that directly impact on the project results; or
- validation protocol requirements have not been met; or
- there was a risk that the project would not be accepted as a VCS project or that emission reductions will not be certified.

The validation team has also raised “Clarification” (CL), where additional information is needed to fully clarify an issue.

APPENDIX II: RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS			
Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
If the conclusions from the draft Validation are either a CAR or CL, these should be listed in this section.	Reference to the Section of the PD where the relevant CAR or CL is raised.	The responses given by the project participants during the communications with the validation team should be summarized in this section.	This section should summarise the validation team’s responses and final conclusions.

The following team members from SIRIM QAS Intl. were involved in the validation process:

Name	Role	Components reviewed
Mr. Akmar Hisham Saat	Validation Team Leader	Completeness check, desk review, onsite inspection, report preparation.
Mr. Sai Prasad	Technical Expert	Desk review, onsite inspection, issuance of findings.
Dr.G.Vishnu	Validator	Completeness check, desk review, onsite inspection, report preparation.
Mr. S. Sudheendra	Technical Reviewer	Technical issues related to the project.
Mr. G.N.Jayaram	Financial Expert	Financial issues related to the project.

## 2.1 Review of Document

The first PD version 01 (/1/ of Appendix 1) submitted by the client and additional backgrounds documents related to the project description and baseline were reviewed as an initial step of the validation process.

A desk review was further done to assess the following parameters:

1. Project details as per VCS PD template.
2. Applicability and appropriateness of methodology used.
3. Compliance with relevance laws and regulation
4. Correctness of application of baseline and monitoring methodology
5. Demonstration of additionality
6. Monitoring Plan
7. Stakeholders comment
8. Proof of title
9. Supporting documents mentioned in the PD (Grid emission factor, CERC guidelines, commissioning certificate etc.)

A complete list of all the documents reviewed is attached in Appendix 1 of this report.

## 2.2 Follow-up Interviews

After the review of the project description and documents, a site visit was carried out on 08<sup>th</sup> December 2010. During the site visit, physical inspection of the project components followed by interviews with the on-site personnel was carried out to verify the project details. A follow-up meeting was also conducted with the project representatives. The following persons were interviewed.

Name & Designation	Company	Details of Interview
Mr. N.C. Sen  Mr. Deepak Arora	Vice President, Konaseema Gas Power Ltd.  President, Konaseema Gas Power Ltd.	<ul style="list-style-type: none"> <li>➤ General information about the project.</li> <li>➤ Financial analysis, project barrier and additionality.</li> <li>➤ General information about the project &amp; the PD</li> <li>➤ Baseline determination</li> <li>➤ Monitoring and management</li> <li>➤ Financial analysis, project barrier and additionality</li> <li>➤ Stakeholder consultation</li> <li>➤ Operation and maintenance procedures</li> </ul>

Mr. P. Nanda Gopal	CDM Consultant	<ul style="list-style-type: none"> <li>➤ General information about the project &amp; the PD.</li> <li>➤ Baseline determination</li> <li>➤ Monitoring and management.</li> <li>➤ Financial analysis, project barrier and additionality.</li> <li>➤ Stakeholder consultation</li> </ul>
N. Satyanarayana	Chief General Manager, Konaseema Gas Power Ltd.	<ul style="list-style-type: none"> <li>➤ Operation and maintenance procedures</li> <li>➤ Training.</li> <li>➤ Calibration and maintenance of monitoring &amp; measuring equipment.</li> <li>➤ Potential risk and the emergency procedures</li> </ul>
K. Radhakrishna	General Manager (O & M), Konaseema Gas Power Ltd.	
Mr. V.Srinivas	<u>Local Stakeholders</u> Devarapalli village	<ul style="list-style-type: none"> <li>➤ Stakeholder meeting agenda</li> <li>➤ Members present</li> <li>➤ Issues raised</li> <li>➤ Replies of the PP</li> </ul>
Mr. Nageshwara Rao	Vedireswaram village	

During the site visit, the actual on-site practices adopted and followed for the operation of the project were compared with the description given in the PD. The grid-connectivity, metering practices, calibration and level of accuracy were examined. The archived data of the energy generated was also reviewed.

### 2.3 Resolution of Corrective Action Requests and Clarifications

The objective of this phase of the validation is to resolve the request for corrective actions and clarification and any other outstanding issues which needed to be clarified prior to SIRIM QAS Intl.'s conclusion on the project description based on the site inspection and review of documents, such that the project activity meets the VCS 2007.1 requirements. Eight (08) Corrective Action Requests and ten (10) Clarification Requests raised by validation team were resolved during communication between the client and the validation team. In order to ensure the transparency of the validation process, the concerns raised and responses that have been documented in Appendix II of this report

### 2.4 Internal Quality Control

SIRIM QAS Intl. has established an internal quality control process. A Technical Reviewer has been appointed to review the final draft validation

report. The final draft report after all findings have been resolved was then submitted to the Authorised Representative for final review and approval.

### 3 Validation Findings

#### 3.1 Project Design

Project identification, design & development and implementation were evaluated as per the requirements of VCS 2007.1.

The project activity of KGPL involves the installation of a 445 MW natural gas fired gas turbine based combined cycle power plant located at Devarapalli in East Godavari district, Andhra Pradesh, India, for generation and supply of electricity to Andhra Pradesh state electricity grid, governed by a power purchase agreement with APTRANSCO.

The project activity falls under scope number 1, sectoral scope – Energy industries (non-renewable sources) being a Grid-connected electricity generating project using non-renewable fuel in energy industries.

The geographical coordinates of Devarapalli village are Latitude: 17° 01' 60' N; Longitude: 81° 32' 60' E. The location of the proposed project activity was physically verified during the on-site visit. The geographical coordinates of the project activity as mentioned in the PD were cross checked with globally accessible satellite based imagery data software and found to be consistent. The site details such as the survey number and village were cross checked with land documents (/6/ of Appendix 1) and found to be correct.

The project start date is 04th June 2009. This was confirmed by the review of the Commercial Operation Date (COD) of the project (/7/ of Appendix 1).

The project activity has chosen a fixed crediting period of 10 years, starting from 04<sup>th</sup> June 2009 to 03<sup>rd</sup> June 2019. The VCS crediting period will be terminated in between if the project activity achieves the CDM registration. This was verified during the discussion with the PP and compared with the expected operational life time of 15 years as mentioned in "The Gazette of India, Extraordinary" [Part II-SEC. 3(ii), Ministry of Power Notification, dated 29th March 1994] (/8/ of Appendix 1) is considered reasonable.

In order to validate the technical specifications of the project activity as mentioned in the PD, the technical specifications of the equipment were cross verified with the details provided in the notice to proceed to EPC contractor (/9/ of Appendix 1), and were found to be correct and consistent.

The project design is sound and reflects good engineering practices and the geographical (Devarapalli village, East Godavari District, Andhra Pradesh, India) and temporal (15 years) boundaries of the project are clearly defined. The project boundary consists of the equipment viz., gas turbine generator, steam turbine generator, auxiliary equipment of gas turbine and generator, heat recovery steam generator and steam turbine and generator, meters,

pipelines and all power plants connected physically to the baseline grid, which is the southern grid of India.

The project activity plant is operating at the peak design PLF presently. As per the PPA, the entire electricity generated would be sold to the grid based on the tariff rate specified in the PPA. The project is expected to displace 3,313 GWh of fossil fuel dominated energy from Southern Grid, which is equivalent to 1,358,857 tonnes of CO<sub>2</sub>e per annum.

The CO<sub>2</sub> emissions due to extraction, processing and transportation of fuel outside the project boundary are being accounted for as leakage emissions to calculate the net emissions reduction. Leakage emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system has been conservatively calculated as 97,909 tonnes of CO<sub>2</sub> based on the applicable methodology AM0029.

The validation team has verified that the project has not received any public funding and/or Official Development Assistance (ODA). The project is a unilateral project and has considered 70:30 debt to equity ratio based on the CERC guidelines available at the time of investment decision.

In line with the VCS requirements, proof of title of the project proponent was verified with the EPC contract and PPA (/9/ and /10/ of Appendix 1). In both the documents, the PP's name (i.e., Konaseema Gas Power Ltd) was found to be consistent and will own the VERs generated by the project.

To ensure that the environmental credits generated by the project are not double counted under VCS, an undertaking letter was provided by Konaseema Gas Power Ltd mentioning that the project activity is under CDM validation where the crediting period starts from the date of registration and that the present verification term for VCS does not overlap with the expected date of CDM activity registration and the project has not been rejected under other GHG programme and is under validation as CDM project (/11/ of Appendix 1).

The project meets the general requirements of VCS 2007.1 with respect to project start date, project scope and crediting period according to clause 5.1, 5.2 and 5.3.

The validation team confirms that the project descriptions and project design in PD were accurate and complete based on the document review, on-site inspection, physical verification and Interviews conducted.

Two CARs and one CL were raised as follows:

CAR 1 was raised for non-submission of documents pertaining to VCS guidelines relating to implementation of the project to create GHG emissions primarily for the purpose of its subsequent removal or destruction nor the

project has not created another form of environmental credit (for example renewable energy certificates) / rejected under other GHG projects.

CAR 3 was raised as the PD did not identify the geographical/ physical boundaries of the baseline grid.

CL 1 was raised as the project crediting period start date and project start date were indicated to be similar.

These CARs and CLs were adequately addressed, resolved and closed in revised PD version 02.1. The resolution of each CAR and CL is represented in Appendix II: Resolution of Corrective Action and Clarification Requests.

### **3.2 Baseline**

The 445 MW natural gas based combined cycle power project at Kothapetta uses the latest approved baseline methodology AM0029 (“Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas”, version 3). The applicability of the methodology has been discussed in section 2.4 of PD. The project fulfills the applicability conditions as below:

The project activity of KGPL involves utilization of natural gas as the only fuel source to generate power. No other start up fuel is to be used for the project activity. Electricity generated from the proposed project activity will be supplied to the Andhra Pradesh state grid, which in turn forms a part of the Southern Grid whose boundaries are clearly identified and its information is publicly available from Central Electricity Authority, Government of India.

For the project activity, KGPL has made agreements with M/s Gas Authority of India Limited (GAIL) (/12/ of Appendix 1) for the gas supply quantity of 1.60 MCMD natural gas on firm basis and 0.4 MCMD on fall back basis till 31st December 2019.

Natural gas reserves are sufficiently available in the country and, at the time of real action of the project activity, the reserves were to the order of 751 Billion Cubic Metres (2002-2003, <http://petroleum.nic.in/petstat.pdf>) in comparison to the supply commitment by GAIL towards the project activity of 2.00 MCMD (which is equivalent to 730 MCM per year considering an operation of 365 days in an year). This means that the commitment of natural gas quantity to the project activity by GAIL is only 0.097% of the total reserves of natural gas during the period of 2002-2003 and the available reserves are capable of firing more than 1000 times the installed capacity of the project activity. The gas availability in the country after 3 years of the date of award of the EPC Contract (generally the time required to construct the infrastructure facility) of the project activity is 1101 BCM which is capable of firing more than 1500 times the installed capacity of the project activity.

In the state of Andhra Pradesh, the demand from consumers having firm commitments for supply in the year 2001-2002 was 6.12 MCMD. Against this

demand, the availability from GAIL for the year 2001-2002 was 7.50 MCMD. Further, the announcement of consideration of Lanco's Kondapalli (<http://petroleum.nic.in/clip4151206.pdf>) and ongoing 768 MW expansion (<http://asian-power.com/regulation/more-news/ge-supply-parts-and-services-vemagiri-plant>; [http://www.gmrgroup.in/corporate/pdf/GIL\\_Q3-FY\\_11\\_-\\_Press\\_Release\\_Ver3\\_0\\_Final.pdf](http://www.gmrgroup.in/corporate/pdf/GIL_Q3-FY_11_-_Press_Release_Ver3_0_Final.pdf)) at Vemagiri power projects by Ministry of Petroleum (Government of India) as well as 800 MW GVK Gautami Power Ltd., prove that the project in question is not depriving any other future users. Hence, it is without doubt that this project activity will not constrain future natural gas based power capacity additions, comparable in size to the project activity.

The above information was checked and verified to be correct from the note on gas availability (/13/ of Appendix 1).

The demand supply data of India available from Ministry of Petroleum and Natural Gas shows that the country's natural gas consumption has been less than the gross production (/14/ of Appendix 1).

The spirit of emphasizing "sufficient availability" of NG in the methodology as an applicability criterion is:

- to ensure that NG from other users are not diverted and
- to ensure future power generation facilities of comparable size are not deprived due to NG being taken up by the project activity

The above are emphasized in the clarification provided by CDM EB [Ref: F-CDM-AM-Clar\_Resp\_ver 01.1 – AM\_CLA\_0091]. The clarification was requested for applicability of the above criterion to a project activity which was constructing a power plant using LNG imported from Australia. Clarification was requested on how to define sufficient availability of natural gas in this situation.

The EB response clearly stated that this condition is required to ensure the project activity does not displace natural gas that would otherwise be used elsewhere in an economy of the country or region, thus leading to possible leakage. Notwithstanding where the natural gas is imported from, this applicability condition is to be implemented by demonstrating, through monitoring, that the full demand of natural gas by the project activity is dedicatedly met with imported gas, and where dedicated imports is not the case, the monitoring should show that satisfying the project activity's demand for natural gas will not lead to a shortages in supplies of the gas to other projects within the country.

The above clarification clearly indicates that gas availability in region actually means that consumption of NG by the project activity would not lead to shortage of supplies to other projects within the country. Such conditions would be met, when:

1. There is enough gas reserves in the country

2. There are provisions and plans to make the gas available in the country (gas supply infrastructure).

If the above two conditions do not satisfy the demand, then there are enough infrastructure capacity to import and distribute this fuel in the country

Natural gas production which was insignificant at the time of independence in 1947 has risen to remarkable levels in the late 90s and in early 2000. Production which was at 26.4 BCM in 1997-98 increased to 31.9 BCM by 2003-04 and presently stands at 47.51 BCM (2009-10) (/14/ of Appendix 1). MOP&NG statistics also shows that free market availability of gas (“Around 8.5 MCMD of gas is being directly supplied by the JVs/private companies at market prices to various consumers. This gas is outside the purview of the Government allocations.”) and also acknowledges that the further LNG imports will increase market availability.

The validation team verified the information provided and concluded, that, future natural gas based power capacity additions would not be constrained as a result of the use of gas in the project activity and hence the applicability condition of the methodology pertaining to the availability of natural gas is met by the project activity.

**Consideration of alternatives**

The project participant identified all the plausible and credible alternatives to the project activity and the reasons for their exclusion / inclusion are explained below:

The various possible alternatives available with the PP at the investment decision time (October 2003) include the following:

No	Alternative to project activity	Justification of feasibility / non-feasibility
1	The project activity i.e. 445 MW NG based combined cycle power plant with an efficiency of 50%-55% and with a lifetime of 15 years not taken as a VCS project activity.	The natural gas project (445 MW) with a lifetime of 15-20 years <sup>1</sup> is intended to supply power to the southern grid of India, meeting the base load requirements and it complies with the entire legal and regulatory requirements which are a credible and feasible option. Also the activity would have faced barriers as discussed in the PD.
2	The project activity i.e. 445 MW NG	Open cycle gas plants consist of a single compressor/gas turbine that is connected to an

<sup>1</sup> [http://cercind.gov.in/160502/comp\\_bidding.pdf](http://cercind.gov.in/160502/comp_bidding.pdf)

	based open cycle power plant with an efficiency of 35%-42% and with a lifetime of 15 years not taken as a VCS project activity.	electricity generator via a shaft. But the system has got very low system efficiency as compared to the combined cycle because of the high exhaust loss. They are usually used to meet peak-load demand and offer moderate electrical efficiency of between 35% and 42% (lower heating value, LHV) at full load. <a href="http://www.iea-etsap.org/web/E-TechDS/PDF/E02-gas_fired_power-GS-AD-gct.pdf">http://www.iea-etsap.org/web/E-TechDS/PDF/E02-gas_fired_power-GS-AD-gct.pdf</a> . Further as this option does not meet the base load requirements and is not economically feasible due to low efficiency is not considered as a credible alternative.
3	Natural gas based – cogeneration, supplying heat and electricity to the end user.	The project activity involves only supplying electricity to the grid and does not involve thermal energy supply generation. Hence this is not considered as a credible alternative.
4	Power generation from diesel based power plant ( with a lifetime of >20 years and efficiency of 50%)	CEA database Version 5.0 lists the diesel based power plants connected to the Southern Grid listing capacities in the range of 21 MW to 200 MW. Hence, similar capacity diesel based power plants can be a realistic alternative and hence considered further in the analysis.
5	Coal based power generation (500 MW Sub-critical plant with a lifetime of 25-30 years)	Coal based sub-critical technology is a viable option as evidenced from the section 7, Electricity Act, 2003 /15/ which specifies that any generating company (the PP) can establish, operate and maintain a power plant. This alternative, in the efficiency range of 32-38%, will meet the base load requirement of the grid and is in compliance with all the legal requirement.
6	Power generation using energy sources other than natural gas	<p>The various alternative energy sources that can generate power other than natural gas include:</p> <p>Power generation using coal as the energy source with an efficiency of 34%-36% (/16/ of Appendix 1) and a lifetime of 25-30 years (/17/ of Appendix 1).</p> <p>This is a realistic and credible alternative to the PP, which delivers base load power to the grid. Hence, this is a plausible baseline scenario.</p> <p>Power generation using wind as the energy source with an average PLF of 20% with a life of 20 years (/18/ of Appendix 1).</p> <p>Power generation from wind does not meet the base load requirement for the grid on a continuous basis as</p>

		<p>wind is seasonal in nature and the capacity utilization factor is very low. Due to the high uncertainty of wind, it is not a credible and realistic option for the project proponent for such high capacity comparable to the project activity.</p> <p>Power generation using hydro electric power plant with an average PLF of 60% (/19/ of Appendix 1) (<a href="http://www.sandrp.in/hydropower/crtlenv_issue_wcd.pdf">http://www.sandrp.in/hydropower/crtlenv_issue_wcd.pdf</a> pg. 5, 2<sup>nd</sup> last line).</p> <p>The different types of hydro power projects available with the project proponent include:</p> <p>Reservoir storage based hydro power plants (/20/ of Appendix 1).</p> <p>This is not a plausible baseline scenario as it delivers peak-load power to the grid and not the base load power.</p> <p>Run-of-river based hydro power projects</p> <p>Power generation from hydro is not a feasible alternative to the project activity as it involves high gestation periods and also cannot meet the base load power requirement for the grid on a continuous basis due to the uncertainty of monsoons (<a href="http://www.brighthub.com/environment/renewable-energy/articles/7826.aspx">http://www.brighthub.com/environment/renewable-energy/articles/7826.aspx</a>). Moreover, the hydro power projects are not credible and realistic alternative to the PP due to the following reasons.</p> <ul style="list-style-type: none"> <li>• Hydro power projects are comparatively capital intensive. In the context of resource shortages and continuing power shortages, thermal projects (coal, liquid fuel and gas), which need a relatively short gestation period, have been getting priority in fund allotments.</li> <li>• The existing tariff formulation norms for hydro projects (based on a cost plus approach) with no premium for peaking services and the provision for 12% free power to distressed states from the initial years are also proving to be deterrents.</li> </ul> <p>Hence, the alternative is not taken as a baseline scenario.</p>
7	Power generation using nuclear fuel	This scenario is available only to Nuclear Power Corporation of India Limited, a 100% Government of India owned company, whose capacity additions are

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		<p>driven by the Government of India's initiatives based on its long term strategic programmes and not by the project activity. Hence, this option is not available for any of the stakeholders including the project participant (Page 17, clause 22 of the Atomic energy ACT 1962) (/21/ of Appendix 1).</p> <p>Therefore this alternative is not taken as a baseline scenario.</p>
6	Electricity imports from other grids	<p>This is not a realistic alternative as all the other grids are themselves facing shortages in meeting the energy demands, especially at the peak demand (<a href="http://www.cea.nic.in">www.cea.nic.in</a>). This alternative also does not deliver the same output comparable to the project activity due to the high transmission losses.</p> <p>Hence, this alternative is not considered as a feasible and credible alternative under the existing scenario.</p>
7	Coal fired supercritical power plant:	<p>The coal fired supercritical power plant is new advanced technology. However, the technology was not available in India in 2003 (at the time of project activity decision was made). The first supercritical power plant in India was being built in 2006. (<a href="http://www.ese.iitb.ac.in/aer2006_files/papers/031.pdf">http://www.ese.iitb.ac.in/aer2006_files/papers/031.pdf</a>, <a href="http://goliath.ecnext.com/coms2/summary_0198-211733_ITM">http://goliath.ecnext.com/coms2/summary_0198-211733_ITM</a>)</p> <p>Hence, this alternative is not taken as a baseline scenario.</p>

From the above discussion it is evident that the plausible baseline scenarios identified by the PP include:

Fuel	Technology	Output and Service
The project activity i.e. 445 MW NG based power plant with an efficiency of 50%-55% and with a lifetime of 15 years not taken as a VCS project activity.	Combined cycle gas turbine	Full year generation at peak capacity
Coal based power generation (500 MW Sub-critical plant with a lifetime of 25-30 years)	Sub critical	Full year generation at peak capacity

Power generation from diesel based power plant ( with a lifetime of >20 years and efficiency of 50%)	DG sets	Full year generation at peak capacity
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The levelised tariff was calculated (/22/, /23/ and /24/ of Appendix 1) for the plausible baseline options to the proposed project activity, as mentioned below:

1. New power plant (s) based on natural gas and
2. New power plant (s) based on coal
3. New power plant (s) based on diesel

From the levelised cost analysis (detailed in additionality section) it is observed that, using coal as fuel with sub-critical technology is the economically most attractive alternative for producing power in Andhra Pradesh and thus forms the baseline scenario. With this option, the GHG emissions will be more than the CDM project activity, while it is also observed that the project activity is not the most economical option for power production. As per this, the fossil fuel (Coal using Sub-critical technology) based power plant, was found to be economically more attractive alternative and thus forms the baseline scenario. The same was also confirmed by performing sensitivity analysis on the critical parameters (fuel price, PLF and heat rate) as defined under the guidance for investment analysis.

The project participant has calculated and used the baseline emission factor as the lowest among the options required by the methodology. The value of the emission factor corresponds to the build margin calculated according to the 'Tool to calculate the emission factor for an electricity system (/25/ of Appendix 1).

Options	Emission Factor (tCO <sub>2</sub> e/MWh)
Build Margin	0.8200
Operating Margin	0.9867
Combined Margin	0.9033
Emission factor of coal based power plant	1.0304

The emission factors such as operating margin (OM), and build margin (BM) have been evaluated according to the procedures prescribed in 'Tool to calculate the emission factor for an electricity system Version 02 (EB 50)'. Data from the CO<sub>2</sub> Baseline Database for the Indian Power Sector-Central Electricity Authority, version 5.0 (/26/ of Appendix 1), applicable at the time of validation has been used in the revised PDD. The emission factor of coal (sub-bituminous) has also been derived from the CEA database Version 5.0 which was checked and verified to be appropriate and conservative.

Accordingly, the baseline emission factor value applicable to the project activity is 0.8200 tCO<sub>2</sub>e/ MWh.

As per the applicable methodology, the project boundary includes the project site and all power plants connected physically to the baseline grid as defined in “Tool to calculate emission factor for an electricity system”. In accordance to this, the project boundary comprises of the project site and all power plants connected physically to the Southern Grid. The specific components and facilities included in the project boundary are the gas turbine, heat recovery steam generator, steam turbine generator, station transformers, auxiliary equipments of gas turbine and generator, heat recovery steam generator and steam turbine and generator; meters (gas, electricity) and gas supply pipelines.

Based on the project boundary, CO<sub>2</sub> is indicated as the main source of the baseline emissions and the project emissions, which is correct as per the project activity and the applicable methodology.

It is the opinion of the validation team that the methodology is correctly quoted and applied by comparing it with the actual text of the applicable version of the methodology available on the UNFCCC CDM website and the selected methodology is applicable to the project activity. Also, the credible baseline alternatives have been chosen and exclusion of the alternatives has been appropriately justified to arrive at the applicable baseline and the project boundary along with the sources of GHG emissions and activities (baseline and project activity) has been clearly explained. The emission reductions have been correctly calculated based on the applicable formulae and applicable emission factor, which are detailed in the GHG calculations section.

The validation team therefore confirms that the selected baseline scenario reasonably represents what would happen in the absence of the project activity. Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and deemed reasonable. The validation team confirms that the identified baseline scenario is the most reasonable baseline scenario for the proposed VCS project activity.

CAR 2 was raised regarding applicability of the methodology for the project activity on issues relating to sufficient availability of Natural Gas and whether the implementation of the project has an adverse impact on the future proposed NG projects in the region

CL 2 was raised to seek clarification on the regulatory aspects of gas allocation in India on whether allocation is based on government control and whether such a policy accounts for effects on baseline and leakage (if any) and whether leakage is considered and if so on what basis it is monitored.

CL 4 was raised as it was not evident in the PD that Natural Gas was BAT (Best Alternative Technology) at the time of the investment decision. The basis of arriving at the different lifetimes for the credible options for baseline

and project activity with relevant supporting documents was also not justified clearly.

These CARs and CLs were adequately addressed, resolved and closed in revised PD version 02. The resolution of each CAR and CL is represented in Appendix II: Resolution of Corrective Action and Clarification Requests.

### 3.3 Additionality

As specified in the approved methodology AM0029 version 03, the assessment and demonstration of additionality has been carried out based on sub-step 2b- option II- Investment comparison analysis. The levelized tariff for all the plausible options to the proposed project activity has been calculated and presented. The key assumptions in validating the appropriateness and justification for each of the parameter for calculating the levelised cost for the project activity are given below:

Parameters	Values	Source	Justification
Capacity (MW)	445 MW	Third party DPR /27 / and internal Technical Appraisal report /28/	The capacity has been cross checked with the technical specifications and EPC contract and is confirmed to be accurate.
PLF	85 %	Third party DPR and internal Technical Appraisal report	As per detailed project report based on the PPA /29/ signed with APTRANSCO. Comparing with CERC guidelines /30/, the assumed PLF is conservative.
Construction period	2 years	Third party DPR and internal Technical Appraisal report	Comparable to the similar capacity projects with similar technology.
Project cost	(Rs Million) - 13,647  (Rs. 30.66 million / MW)	Third party DPR and internal Technical Appraisal report	Reflects realistic values as compared to CEA expert committee report /31/ in which similar capacity projects were approved, the project has also later achieved financial closure and taking in to account escalation costs, hence conservative. Also the detailed break up as per the EPC contract was cross-verified and the value was found to be comparable.
Discount factor	11%	RBI guidelines; <a href="http://www.rbi.org.in/scripts/WSSView.aspx?Id=6396">http://www.rbi.org.in/scripts/WSSView.aspx?Id=6396</a> dated	The value is appropriate and correctly applied as per the prevailing lending rates issued by RBI at the

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		27th Sep, 2003	time of investment decision.
ROE	16 %	CERC (Terms and Conditions of Tariff) Regulations, 2001)	The value is in line for thermal power plants installed in year 2001-2004 according to Central Electricity Regulatory Commission (CERC) guidelines 2001.
Auxiliary Consumption	3.00 %	CERC (Terms and Conditions of Tariff) Regulations, 2001	The value is in line for thermal power plants installed in year 2001-2004 according to Central Electricity Regulatory Commission (CERC) guidelines 2001
Gross Station Heat Rate -	1850 (kCal/kWh)	Third party DPR and internal Technical Appraisal report	Conservative, compared to the combined cycle station heat rate recommended for gas based power plant according to CERC guidelines.
Interest on Debt (Indian Currency) -	11.0%	RBI guidelines; <a href="http://www.rbi.org.in/scripts/WSSView.aspx?Id=6396">http://www.rbi.org.in/scripts/WSSView.aspx?Id=6396</a> dated 27th Sep, 2003	The value is appropriate and correctly applied as per the prevailing lending rates issued by RBI at the time of investment decision.
Book Depreciation -	5.28%	The Company's Act, 1956 Section 14.	The value applied is in line with the Company's act, 1956 Section 14 and hence appropriate
Annual O&M expenses -	2.50%	Third party DPR and internal Technical Appraisal report	The value applied is comparable with CERC Terms & Conditions of Tariff 2001
Annual O&M Escalation	6.00%	Third party DPR and internal Technical Appraisal report	The value applied is comparable with CERC Terms & Conditions of Tariff 2001
Interest on Working Capital	11%	RBI guidelines; <a href="http://www.rbi.org.in/scripts/WSSView.aspx?Id=6396">http://www.rbi.org.in/scripts/WSSView.aspx?Id=6396</a> dated 27th Sep, 2003	The value is appropriate and correctly applied as per the prevailing lending rates issued by RBI at the time of investment decision.
Equity	30%	Third party DPR and internal Technical Appraisal report	The assumed debt: equity ratio is according to CERC guidelines.
Debt	70%		
Gross calorific value	(kCal/SCM) 8800	Third party DPR and internal Technical Appraisal report	The calorific value applied is found to be in comparable range with the value in the actual gas invoices.
NG price	(Rs/SCM)	Third party DPR and internal Technical	The assumed value is conservative comparing

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	6.510	Appraisal report	with the NG pricing trend available on <a href="http://www.oilnergy.com/1gnymex.htm#since30./32/">http://www.oilnergy.com/1gnymex.htm#since30./32/</a>
Annual fuel price escalation	7.00%	Third party DPR and internal Technical Appraisal report	The value is appropriate and conservative when compared with the Guidelines for Determination of Tariff by Bidding Process for Procurement of Power by Ministry of Power (2005) /33/ and the increase in NG price observed at the time of investment decision <a href="http://www.oilnergy.com/1gnymex.htm#since30.">http://www.oilnergy.com/1gnymex.htm#since30.</a>

The assumptions considered for calculating the levelized cost of generation for the other plausible alternatives considered as baseline (b) i.e. power generation using coal as the energy source and (c) power generation using diesel as the energy source are described in the table below.

Parameter	Coal*	Diesel**	Justification
Capacity (MW)	500 MW	450 MW	*Nearest block available as per CEA /34/ ** Nearest block size considering 9 units of 50 MW capacity each
PLF	80%	75%	*CERC (Terms and Conditions of Tariff) Regulations, 2001 ** Notification on operational norms for thermal generation issued by Ministry of Power, 1999 /35/
Discount factor	11%		Based on RBI guidelines; <a href="http://www.rbi.org.in/scripts/WSSView.aspx?Id=6396">http://www.rbi.org.in/scripts/WSSView.aspx?Id=6396</a> dated 27th Sep, 2003. Same as project activity
Return on equity	16%	16%	Same as project activity based on CERC 2001 guidelines
Auxiliary Consumption	9.50%	4.00%	*CERC (Terms and Conditions of Tariff) Regulations, 2001 ** Notification on operational norms for thermal generation issued by Ministry of Power, 1999 As both sources are from Government regulatory orders available at the time of investment decision, found acceptable
Gross Station Heat Rate (Kcal/KWh)	2,460	2,000	*CERC (Terms and Conditions of Tariff) Regulations, 2001 Page no 7 ** Notification on operational norms for thermal generation issued by Ministry of Power, 1999 As both sources are from Government regulatory orders available at the time of investment decision, found acceptable

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Interest on Long Term Loan	11%		Based on RBI guidelines; <a href="http://www.rbi.org.in/scripts/WSSView.aspx?Id=6396">http://www.rbi.org.in/scripts/WSSView.aspx?Id=6396</a> dated 27th Sep, 2003. Same for project activity
Book Depreciation	5.28%		Based on the Company's act, 1956 Section 14, hence appropriate
Annual O&M expenses	2.50%	2.50%	*CERC (Terms and Conditions of Tariff) Regulations, 2001 P.No 11 **Review paper by CERC- Formulation of operational cost norms for Thermal Generation by CERC august 2000 As both sources are from Government regulatory orders available at the time of investment decision, found acceptable
Annual O&M Escalation	6.00%	7.00%	*CERC (Terms and Conditions of Tariff) Regulations, 2001 P.No 12 **Review paper by CERC- Formulation of operational cost norms for Thermal Generation by CERC august 2000 /36/ As both sources are from Government regulatory orders available at the time of investment decision, found acceptable
Interest on Working Capital	11%		Based on RBI guidelines; <a href="http://www.rbi.org.in/scripts/WSSView.aspx?Id=6396">http://www.rbi.org.in/scripts/WSSView.aspx?Id=6396</a> dated 27th Sep, 2003. Same as project activity
Total Project Cost (Rs. In million)	20,000	36.968	* The values are conservative (@Rs.40 Million/MW) compared to State/Central Sector Thermal Schemes Appraised by CEA  **Samalpatti DG PP (M/s. Samalpatti Power Pvt Corporation ) for 106 MW <a href="http://www.infraline.com/power/ipp/StatusOfPowerProjects-March.htm#Index">http://www.infraline.com/power/ipp/StatusOfPowerProjects-March.htm#Index</a> As both sources are comparable to similar investments at the time of investment decision, found acceptable
Equity : debt	70 : 30		Same as project activity, as per CERC guidelines, 2001
Gross calorific value (kCal/kg)	4,760	10,000	*Data available from Singareni colliery; Price notification 4/10/2001 and applicable taxes /37/ ** <a href="http://www.indiasolar.com/cal-value.htm">http://www.indiasolar.com/cal-value.htm</a> As both sources are available at the time of investment decision, found acceptable
Total Price (Rs/Tonne)	1357	19.73	*Data available from Singareni colliery; Price notification 4/10/2001 and applicable taxes ** India's Petrol, Diesel, Kerosene & LPG prices published periodically by Reuters /38/ As both sources are available at the time of investment decision, found acceptable
Annual Fuel price increase	4.00%	4.00%	Based on annual inflation rates as per IMF Database /39/. Average value for previous 4 years , hence acceptable As sources are based on annual inflation rates of host country and are found conservative in comparison with actual fuel

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			increase rates for the respective fuels , found acceptable
Specific gravity	NA	0.83	** <a href="http://www.essom.com/backend/data-file/engineer/engin21_1.pdf">http://www.essom.com/backend/data-file/engineer/engin21_1.pdf</a> /40/ available at the time of investment decision, found acceptable

The validation team has confirmed that the values assumed / applied have been sourced from authentic document / references which were cross checked and found to be appropriate, conservative and correct.

Based on the values assumed, a levelised cost of Rs.3.29/kWh has been calculated for the project scenario implemented without VCS while the credible baseline scenarios of coal resulted in levelised cost of Rs.2.00/kWh has been calculated for the natural gas and coal for power generation which is conservative and correct and in accordance with para 6 of EB 51, annex 58 (i.e., Guidelines on investment analysis). The below table summarizes the levelized cost of electricity generation for various alternatives.

Scenario	Levelized Cost of generation
445 MW CCGT Plant (without VCS benefits )	3.29 INR/kWh
500 MW Coal-fired power plant	2.00 INR/kWh
450 MW Diesel based power plant	7.32 INR/kWh

Based on the calculations it has been established that the credible options available at the time of investment decision are financially more attractive, compared to the least polluting but more expensive option which is the project activity. Thus, the economically attractive baseline scenario as identified by the investment analysis using the levelized cost of electricity generation (in Rs./kWh) as the financial indicator is the alternative in which is power generation using coal as the energy source.

Based on the calculations it has been established that the credible options available at the time of investment decision are financially more attractive, compared to the least polluting but more expensive option which is the project activity. The project activity is concluded to be additional and the revenues from CERs will help in making the project viable.

### **Sensitivity analysis:**

A sensitivity analysis is performed for all alternatives; to confirm that the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions i.e. the project capital cost, fuel price, plant load factor, Heat Rate and GCV. Project cost is varied as it is taken as per investment decision date. Actual project cost is higher due to delay in commissioning and increase in IDC component.

In accordance with para 17 of the investment guidance in EB 51, the project proponent has conducted a sensitivity analysis on the financials by varying the parameters which have a bearing of 20% or more on either the project costs or the project revenues and has tabulated the results

<b>Sensitivity analysis considering variation in fuel price</b>			
<b>Price of fuel change</b>	<b>-10%</b>	<b>0</b>	<b>+10%</b>
Levelized cost of electricity generation for power generation using natural gas as energy source (Project activity not implemented as VCS Project)	3.03	3.29	3.54
Levelized cost of electricity generation for power generation using coal as energy source	1.90	2.00	2.11
Levelized cost of electricity generation for power generation using diesel as energy source	6.69	7.32	7.95

<b>Sensitivity analysis considering variation in Plant Load Factor (PLF)</b>			
<b>PLF change</b>	<b>-10%</b>	<b>0</b>	<b>+10%</b>
Levelized cost of electricity generation for power generation using natural gas as energy source (Project activity not implemented as VCS Project)	3.37	3.29	3.22
Levelized cost of electricity generation for power generation using coal as energy source	2.12	2.00	1.91
Levelized cost of electricity generation for power generation using diesel as energy source	7.43	7.32	7.23

<b>Sensitivity analysis considering variation in project cost</b>			
<b>Capital cost change</b>	<b>-10%</b>	<b>0</b>	<b>+10%</b>
Levelized cost of electricity generation for power generation using natural gas as energy source (Project activity not implemented as VCS Project)	3.21	3.29	3.36
Levelized cost of electricity generation for power generation using coal as energy source	1.90	2.00	2.10
Levelized cost of electricity generation for power generation using diesel as energy source	7.22	7.32	7.42

<b>Sensitivity analysis considering variation in SHR</b>			
<b>Variation in Station Heat Rate</b>	<b>-10%</b>	<b>0</b>	<b>+10%</b>
Levelized cost of electricity generation for power generation using natural gas as energy source (Project activity not implemented as VCS Project)	3.03	3.29	3.54
Levelized cost of electricity generation for power generation using coal as energy source	1.90	2.00	2.11
Levelized cost of electricity generation for power generation using diesel as energy source	6.69	7.32	7.65

<b>Sensitivity analysis considering variation in GCV</b>			
<b>Variation in Gross Calorific Value (GCV)</b>	<b>-10%</b>	<b>0</b>	<b>+10%</b>
Levelized cost of electricity generation for power generation using natural gas as energy source (Project activity not implemented as VCS Project)	3.57	3.29	3.05
Levelized cost of electricity generation for power generation using coal as energy source	2.12	2.00	1.91
Levelized cost of electricity generation for power generation using diesel as energy source	8.03	7.32	6.75

The sensitivity analysis confirms that the economically most attractive baseline scenario identified in the sub-step 1 is robust to reasonable variations in all the critical assumptions.

The validation team, based on the assessment result by the financial expert engaged, hereby confirms that the assumptions are appropriate, financial calculations are correct and PP has applied all the statutory levies and taxes correctly corresponding to the investment decision date.

### **Common Practice:**

The common practice analysis has been analyzed based on requirements of the additionality tool- sub-step 4a where the analysis of other activities similar to the proposed project activity is done.

In this step, an analysis of any other activities that are similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc has been done.

As per CEA version 3 (/41/ of Appendix 1) the share of the gas based power generation in India is 16% of the total installed thermal power capacity and that of coal based power plants is 82%. The total percentage of installed capacity of the gas based power plants in Southern Region is only 17.2% of the total installed capacity. This corroborates the fact that natural gas based power generation is not commonly carried out practice in India.

According to the 'Tool for the demonstration and assessment of additionality', analysis of any other activities implemented previously or currently underway that are similar to the proposed project activity needs to be performed to describe whether and to which extent similar activities have already diffused in the relevant region. Similar project activities include Natural gas based Grid Connected Power Plant of similar scale that takes place in a comparable environment with respect to regulatory framework, investment climate, and access to technology etc., in the state of Andhra Pradesh with the tariff determined through the International Competitive Bidding Process (ICB) those activities that are implemented previously or currently underway.

To arrive at the power plants that fall under the above said criteria, an analysis is conducted including all the power plants connected to grid that are operational having similar or comparable capacity (200- 500 MW) at the time of investment decision. They include

No.	Power generation units	Unit No.	Capacity	Fuel used
1	K_gudem new	1	250	Coal
2	K_gudem new	2	250	Coal
3	Vijaywada	1	210	Coal
4	Vijaywada	2	210	Coal
5	Vijaywada	3	210	Coal
6	Vijaywada	4	210	Coal
7	Vijaywada	5	210	Coal
8	Vijaywada	6	210	Coal
9	Royal seema	1	210	Coal
10	Royal seema	2	210	Coal
11	R_gudem stps	1	200	Coal
12	R_gudem stps	2	200	Coal
13	R_gudem stps	3	200	Coal
14	R_gudem stps	4	500	Coal
15	R_gudem stps	5	500	Coal
16	R_gudem stps	6	500	Coal
17	Simhadri	1	500	Coal
18	Simhadri	2	500	Coal
19	Peddapuram ccgt	1	220	Natural gas
20	Jegurupadul	1	235.4	Natural gas
21	Spectrum Godavari	1	208	Natural gas

Among the above mentioned power plants, No 19, 20 and 21 are NG based power plants. Although these may use a similar fuel as compared to the project activity, the tariff structure of GPL is different as compared to that of the NG based power plants mentioned above. These power plants have a two part tariff system in which the capital cost was approved by CEA and they are entitled for a fixed return of equity [[http://www.ercap.org/TariffOrders/TO\\_2001-02.pdf](http://www.ercap.org/TariffOrders/TO_2001-02.pdf) page 45].

In contrast to that, the PPA for the project activity was signed with APTRANSCO with the tariff that was fixed for the short gestation projects (Natural Gas Based Power Generation Projects) selected under the International Competitive Bid Process (ICB).

The tariff fixed for the project activity was to match the tariff fixed for the Natural Gas based Power Projects which have participated in the International Competitive Bid Process. The Natural Gas based power plants that have participated in the process and won the bid for the similar tariff include

1. 220 MW GVK Industries Ltd. Jegurupadu power plant<sup>2</sup>
2. 388.5 MW Grid connected electricity generation using natural gas by the Vemagiri Power Generation Ltd<sup>3</sup>.
3. 469 MW Gautami Power Project being promoted by Gautami Power Limited<sup>4</sup>.

All these projects are in different stages of CDM registration process and all of these have already been web hosted for global stakeholder comments (<http://cdm.unfccc.int/Projects/Validation>).

The plants that existed from earlier days in the vicinity namely Spectrum Power Generation and another project from the same project promoters is based on a different tariff structure to include a guaranteed 16% return on equity [<http://www.scribd.com/doc/20623495/GVK-Power-Infrastructure-Initiating-Coverage-11Aug09> (Page 4)].

Thus, all the projects with similar tariff structures are in different stages of CDM registration Process.

The multi-fuel power plants came up in a different investment scenario and have fuel pass through PPA i.e. cost of fuel is paid to the plant under the PPA signed. Naptha power plants cannot be considered in common practice.

As per additionality tool - only 'similar activities' (one condition for similar being those that take place in a similar environment) need to be considered. It should also be noted that there has been no other natural gas based power project that has been commissioned in Andhra Pradesh with the similar tariff structure. The above discussed power projects are already in the CDM pipeline. Hence, it can be concluded that no similar activities have diffused in the relevant region without the consideration of CDM revenue.

Thus in line with the additionality tool, the PP has demonstrated additionality by investment analysis and common practice analysis. Based on the above, the validation team is of the opinion that the project is additional and faces significant barriers. Hence additional support through VCS registration is required for the project to overcome the barriers.

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<sup>2</sup> <http://cdm.unfccc.int/Projects/Validation/DB/82ORS4DFFAE3F7JI64VMOSYQEYXGCB/view.html>

<sup>3</sup> <http://cdm.unfccc.int/Projects/Validation/DB/R6JCKXWNYC9LJFX2PQ13OLGTQT8FNE/view.html>

<sup>4</sup> <http://cdm.unfccc.int/Projects/Validation/DB/T75O751QXNTM82IQ0KN5FUQNSRZ155/view.html>

CAR 4 was raised as the project cost of oil based power plant was not indicated in the PD.

CAR 5 was raised for the following issues

- The PDD did not justify the basis on which all the possible realistic and credible alternatives that provide outputs or services comparable with the proposed VCS project activity are identified. Also the basis on the exclusion of the available alternatives to arrive at the contenders for the baseline was not been substantiated by means of references and supporting documents.
- Further as per the methodology, a sensitivity analysis shall be performed for all alternatives, to confirm that the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions (e.g. fuel prices and the load factor) which the PD has not mentioned.
- The PD did not justify the basis on which all the possible realistic and credible alternatives that provide outputs or services comparable with the proposed VCS project activity are identified. Also the basis on the exclusion of the available alternatives to arrive at the contenders for the baseline had not been substantiated by means of references and supporting documents.
- It was observed that the baseline alternatives presented do not satisfy the requirement of the methodology indicated above fully. For example, exclusion of NG based open cycle power plant is not explained with any reasons. Possibility and constraints if any in import of electricity from connected grids is not discussed. Technology details, efficiency and technical lifetime are not indicated for plausible alternatives. Reasons indicated for exclusion of super critical technology coal power plants were not convincing.
- Baseline scenario established was not in accordance with section 5.10 of VCS standard which also stipulates to meet requirement of ISO 14064-2:2006 clause 5.4.

## **CAR 6**

The common practice analysis in the PD did not substantiate the following with relevant evidences:

- Analysis of other activities similar to the proposed project activity”.
- Did not “Provide an analysis of any other activities that are operational and that are similar to the proposed project activity. (same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect

to regulatory framework, investment climate, access to technology, access to financing, etc)”

CL 3 was raised to clarify the approach of taking levelised cost of electricity generation as financial indicator instead of IRR for comparison and concluding additionality.

CL 5 was also raised to clarify/justify the following

- The basis of including RoE for the calculation of levelised cost as part of expenditure.
- Electricity tariff as per PPA is taken as Rs. 2.43, while levelised cost is calculated as Rs. 2.14/kWh.
- It is seen that depreciation is calculated on the cost of land which is not normally a depreciable asset.
- Income Tax component, not being an item of charge, is also considered as a part of the expenditure.
- Discounting is taken in the first year itself whereas as per normal procedure discounting rate is applicable from second year only.
- Demonstrate how the debt equity ratio adopted is in line with EB guidance 51 para no. 11- according to trends prior to the investment decision
- Demonstrate how the rate of interest assumed is in line with EB guidance 51 para no. 11 - according to the prevailing commercial interest rates in the region.
- Selling price of electricity is taken as Rs 2.43 in the calculation of levelised cost of generation in both gas and coal alternatives.
- Provision exists in PPA for third party sale of excess electricity beyond 80% of declared capacity. It is to be clarified why this additional revenue is not considered in the financials in establishing the additionality.

CL 6 was raised to clarify justify / clarify that coal is a realistic baseline at the time of investment decision in 2004 in the context of the Notice Inviting Tender (/42/ of Appendix 1) advertised on 01/06/1995, which specified project categories as long gestation and short gestation projects.

The issues were adequately addressed, resolved and closed in revised PD version 02. The resolution of each CAR and CL is represented in Appendix II: Resolution of Corrective Action and Clarification Requests.

### 3.4 Monitoring Plan

The project uses approved monitoring methodology “Grid connected electricity generation plants using non-renewable and less GHG intensive fuel”, AM0029, version 3, which is applicable to the project. According to the methodology the following parameters are to be monitored

The ex-ante parameters that are available at the time of validation are indicated below:

Parameter	Source	Value
The Build Margin emission factor of Southern Grid $EF_{BM,y}$	CEA CO <sub>2</sub> Baseline Database, version 05; November 2009,	820 in tCO <sub>2</sub> /GWh
The Operating Margin emission factor of Southern Grid $EF_{OM,y}$	<a href="http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver5.pdf">http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver5.pdf</a>	986.7 in tCO <sub>2</sub> /GWh
The Combined Margin Emission factor of the Southern Grid $EF_{CM}$		903.30 in tCO <sub>2</sub> /GWh
Net Calorific Value of Coal $NCV_{Coal}$		3625 in kCal/ kg
Emission Factor of Coal $EF_{Coal}$		95.8 t CO <sub>2</sub> e/TJ
CO <sub>2</sub> Emission Factor of Natural Gas $EF_{CO_2,NG}$		0.0561 tCO <sub>2</sub> /GJ
CO <sub>2</sub> emission factor of diesel- $EF_{CO_2,diesel}$	2006 IPCC Guidelines for National Greenhouse Gas Inventories	74.1 tCO <sub>2</sub> /TJ
Oxidation factor of natural gas $OXID_{NG}$	IPCC Default Value	1.00
Oxidation Factor of Coal $OXID_{Coal}$	IPCC Default Value	0.98
Emission factor for upstream fugitive methane emissions for baseline fuel i.e coal - $EF_{BL, upstream, CH_4}$	Calculated value based on CEA Version 05 and IPCC data	0.000769 t CH <sub>4</sub> /MWh.

The ex-ante parameters to be monitored are

- Net quantity of natural gas consumption by the project plant during the year, y in SCM or m<sup>3</sup>
- Net quantity of LNG consumption by the project plant during the year, y in SCM or m<sup>3</sup>
- Net calorific value of natural gas in kCal/SCM or m<sup>3</sup>
- Electricity generation in the project plant in GWh

The monitoring equipment used are:

- Main meter and Check meters for metering the exported electricity to the grid.
- Energy meters for metering gross electricity generation and auxiliary power consumption.
- Flow meter for consumption of natural gas in the project.

It was confirmed from the site visit and the invoices raised (/43/ of Appendix 1) to the state electricity board that the project design has got provisions to monitor the fuel (NG) from both the supplier (GAIL and RIL) and the consumer (GPL) which acts as a system of cross –verification to arrive at the correct value on a conservative basis.

Section 3.4 of PD describes in detail the responsibility, authority, monitoring, measurement, reporting, archiving, the QA / QC procedures related to calibration, meter testing, internal audits, maintenance of monitoring equipment and monitoring plan implementation which are found to comply with the requirements of the applicable methodology. The O & M is undertaken by the plant personnel appointed by third party engineering company (/42/ of Appendix 1).

The grid emission factor was calculated from the Operating Margin (OM) CO<sub>2</sub> emission factor, Build Margin (BM) CO<sub>2</sub> emission factor and emission factor of coal (sub-bituminous) have been evaluated according to the procedures prescribed in 'Tool to calculate the emission factor for an electricity system Version 02'. Data from the CO<sub>2</sub> Baseline Database for the Indian Power Sector-Central Electricity Authority, version 5.0 (/43/ of Appendix 1), applicable at the time of validation has been used in the PD.

The value of the following parameters were checked and verified from CEA version 5 and found to be appropriate and conservative

<b>Parameter</b>	<b>Emission Factor (tCO<sub>2</sub>e/MWh)</b>
Build Margin	0.8200
Operating Margin	0.9867
Combined Margin (grid emission factor)	0.9033
Emission factor of coal based power plant	1.0304

PP has used the official published data on OM and BM emission factors. The version of the data used is as available on the date of validation. This data is published by CEA, the sole authority for the publication of such data in India. This data is based on the emission factor tool approved by UNFCCC. Validation team accepted this emission factor, since it is based on the official background data published by CEA.

Leakages occurring due to upstream fugitive methane emissions have been considered on a conservative basis based on the methodology AM0029. Leakages have been taken into account considering:

1. Fugitive methane emissions of natural gas envisaged from production, transportation, distribution, and, in the case of LNG, liquefaction, transportation, re-gasification and compression into a transmission or distribution system, in tCH<sub>4</sub> per GJ fuel supplied to final consumers
2. Upstream fugitive methane emissions occurring in the absence of the project activity in terms of ton of methane per MWh

Fugitive Methane Emissions (LE<sub>CH<sub>4</sub>, y</sub>)

As per the applicable methodology, the emission factor for upstream fugitive CH<sub>4</sub> emissions occurring in the absence of the project activity EF<sub>BL,upstream,CH<sub>4</sub></sub> should be calculated consistent with the baseline emission factor (EF<sub>BL, CO<sub>2</sub></sub>) used in equation (2) above. Since the option 1 'build margin' approach is used to calculate the emission factor (EF<sub>BL, CO<sub>2</sub></sub>), the EF<sub>BL,upstream,CH<sub>4</sub></sub> is found using the following equation and it will be determined ex-post.

$$EF_{BL,upstream,CH_4} = \frac{\sum_j FF_{j,k} \cdot EF_{k,upstream,CH_4}}{\sum_j EG_j}$$

Where,

EF<sub>BL,upstream,CH<sub>4</sub></sub> = Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in tCH<sub>4</sub> per MWh electricity generation in the project plant

j = Plants included in the build margin

FF<sub>j,k</sub> = Quantity of fuel type k (a coal type) combusted in power plant j included in the build margin

EF<sub>k,upstream,CH<sub>4</sub></sub> = Emission factor for upstream fugitive methane emissions from production of the fuel type k (a coal type) in t CH<sub>4</sub> per MJ fuel produced

EG<sub>j</sub> = Electricity generation in the plant j included in the build margin in MWh/a

CO<sub>2</sub> emissions from LNG

Project activity does not involve LNG, so  $LE_{LNG,CO_2,y}$  is considered as 'zero' but, in case if LNG is used in future then leakage due to that will be accounted for using the equation 6

$$LE_{LNG,CO_2,y} = FC_y * EF_{CO_2,upstream,LNG} \quad (6)$$

Where:

$LE_{LNG,CO_2,y}$  = Leakage emissions due to fossil fuel combustion/electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system during the year y in t CO<sub>2e</sub>

$FC_y$  = Quantity of natural gas combusted in the project plant during the year y in m<sup>3</sup>

$EF_{CO_2,upstream,LNG}$  = Emission factor for upstream CO<sub>2</sub> emissions due to fossil fuel combustion/electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system

In the absence of the reliable and accurate  $EF_{CO_2,upstream,LNG}$  data, the default value of 6t CO<sub>2</sub>/TJ provided by the methodology will be used.

Presently leakage due to CH<sub>4</sub> fugitive upstream emissions is only accounted for. Then equation (4) becomes:

$$LE_y = LE_{CH_4} \quad (4a)$$

Thus,

$$LE_y = LE_{CH_4,y} + LE_{LNG,CO_2,y}$$

Where,

$LE_y$  = Leakage emissions during the year y in tCO<sub>2e</sub>.

$LE_{CH_4,y}$  = Leakage emissions due to fugitive upstream CH<sub>4</sub> emissions in the year y in tCO<sub>2e</sub>  
= 91525.27

$LE_{LNG,CO_2,y}$  = Leakage emissions due to fossil fuel combustion/electricity consumption associated with liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system during the year y in t CO<sub>2e</sub>.  
= 0

Therefore,

$$\begin{aligned} LE_y &= 91525.27 + 0 \\ &= 91525.27 \text{ tCO}_2 \text{ e} \end{aligned}$$

The validation team is of the opinion that the project participant is able to implement the monitoring plan as

- The monitoring plan is in line with the requirements of the methodology;
- Monitoring arrangements described in the monitoring plan are feasible within the project design;

CAR 7 was raised as section 3.3 of PD, CERs were mentioned instead of VCUs and in section 3.4 of PD under monitoring Plan, CDM Manager has been indicated instead of VCS Manager.

CAR 8 was raised as the Leakage calculations in Section B.6 of the PD were not in conformance with the requirements of AM0029.

CL 7 was raised as Section C.2.2.1 of PD indicated the expected starting date of crediting period is the date of registration of the project which might not exactly coincide with the JMR date

CL 8 was raised to clarify on aspects regarding the storage period at the end of the crediting period or the last issuance of VCUs.

The issues were adequately addressed, resolved and closed in revised PD version 02.1. The resolution of each CAR and CL is represented in Appendix II: Resolution of Corrective Action and Clarification Requests.

### **3.5 Calculation of GHG Emissions**

As per AM0029, the baseline emission sources considered are the power plants connected to the Southern Grid that contribute to its build margin (BM). The project activity uses a lesser GHG intensive fuel and thus proposes to reduce the GHG intensity of the grid to which it supplies. The baseline emission is obtained by multiplying net electricity generated by the project power plant with the build margin baseline emission factor of Southern regional grid as per the data of CO<sub>2</sub> baseline database published by CEA.

The measurement of net electricity generated is according to the applied methodology, established in monitoring section, while the BM applied emission factor has been taken based on comparison of the different options, among which the lowest value has been applied based on CEA version 5 (/44/ of Appendix 1), applicable at the time of validation. Oxidation factor for NG was taken as 1 based on IPCC 2006 "IPCC Guidelines for National Greenhouse Gas Inventories". The energy efficiency of technology in the most likely baseline scenario and is taken as 36.3%, calculated based on CEA Version 5 based on 'Tool to calculate the emission factor for an electricity system'.

The leakage emissions (due to utilization of natural gas as fuel) have been calculated conservatively. Default emission factor for fugitive CH<sub>4</sub> upstream

emissions was taken as 296 tCH<sub>4</sub>/PJ as this is the value recommended by the methodology and applicable to the operational facilities in most of the developing countries. The emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in terms of tonnes of methane per MWh is calculated as 16.01 CO<sub>2</sub>/MU based on CEA Version 5. The net calorific value of 8800 kcal/SCM (energy content) per volume unit of natural gas in year is provided by supplier and recorded by KGPL for verification, which will be cross verified on a continuous basis using a Gas Chromatograph and averaged in the invoice for the metered period.

The estimated emissions reduction E<sub>Ry</sub> by the project activity during a given year y is:

Emission Reductions = Baseline Emissions – Project Emissions – Leakage

$E_{Ry} = 2,717,045 - 1,266,663 - 91,525 = 1,358,857 \text{ tCO}_2\text{e}$

$E_{Ry} = 1,358,857 \text{ tCO}_2\text{e}$

These have been described adequately in section 4 of the PD and in VER calculation sheet (/45/ of Appendix 1) as per the methodology AM0029, Version 3. Hence it is the opinion of the validation team that

- All assumptions and data used by the project participants were listed in the PD, including their references and sources;
- All documentation used by project participants as the basis for assumptions and source of data was correctly quoted and interpreted in the PD;
- The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions;
- All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PD.

The validation team confirms that the estimates of baseline emissions can be replicated using the information provided and the formulas are correctly applied and the calculations done in a transparent way.

CL 9 was raised to clarify the aspects in the GHG calculations on the accounting of the basis of auxiliary consumption and the basis of the Station Heat rate

The issue was adequately addressed, resolved and closed in revised PD version 02.1. The resolution of the relevant CL is represented in Appendix II: Resolution of Corrective Action and Clarification Requests.

### **3.6 Environmental Impact**

A public hearing on the project activity was conducted on 29<sup>th</sup> September 2000 (/46/ of Appendix 1) by Andhra Pradesh Pollution control board as a pre-requisite for environmental clearance, which gave a positive conclusion on the envisaged impacts. The environmental aspects related to the project activity were detailed in the third party DPR (/26/ of Appendix 1) prepared by TCE Consulting Engineers in October 2000. A detailed discussion on the air and water pollution impacts is presented in the report with minimal impact envisaged due to the use of cleaner fuel such as natural gas. The project was awarded consent to establish (letter dated 17<sup>th</sup> December 2000 (/47/ of Appendix 1) from APPCB (Andhra Pradesh Pollution Control Board) which is the local authority. The Department of Forests, Government of Andhra Pradesh has awarded No Objection Certificate (/48/ of Appendix 1) for land usage for the project activity (letter dated 20<sup>th</sup> December 2000). Also the project got environmental clearance (/49/ of Appendix 1) from Government of Andhra Pradesh, India (host country) on 16<sup>th</sup> April 2001.

Thus the plant has been granted the environmental clearances and consents as per the requirements of the regulatory authority of the host country. Also the NCDMA of India through its approval letter has confirmed that the project contributes to sustainable development in India.

The significant environmental impacts of the project activity along with the measures taken to mitigate the impacts and the conclusions are enumerated in section 5 of the PD. As the plant will run on natural gas (a clean fuel), it is ensured that there are no major negative impacts envisaged on the air quality, water environment and land environment of the surrounding region. Moreover the plant authorities have taken necessary care to see that all statutory regulations existing in the country are met. The validation team considered that the project will not have adverse environmental impact.

### **3.7 Comments by stakeholders**

A formal consultation process with the local stakeholders was held on 10<sup>th</sup> October 2006 at project activity premises at Devarapalli (V) Ravulapalem (M), East Godavari District Andhra Pradesh, India. PP had communicated by written invitation in local language (/50/ of Appendix I) which was acknowledged by the attendees in advance before the meeting (/51/ of Appendix I). The meeting was attended by local residents and village presidents of Devarapalli and Vedireswaram villages (/52/ of Appendix I) which are located in the near vicinity.

The project activity was explained to the meeting and a brief presentation on climate change was made. The role of the project activity in the mitigation of climate change and local sociological benefits were explained. Then queries were invited from the local stakeholders.

The main concerns of the stakeholders were with regard to health and skin problems, danger due to leakage of natural gas/liquid fuel, the safety

arrangements that are maintained to face any accidents, whether necessary employment opportunities created to the people of surrounding villages and any community facilities will be provided to the residents of nearby villages. The stakeholders were given clarification on the issues raised to their satisfaction by providing relevant evidence of the project claims. There were no specific comments that required follow up action from the proposed project activity as evident from the minutes of the stakeholder meeting (/53/ of Appendix I) and the description provided in section 6 of the PD.

The information regarding the stakeholders meeting was verified during the site visit by interviewing the relevant stakeholders who had participated and were present at the meeting. The interviewed persons confirmed the information provided in the PD and the documents / record of the local stakeholder consultation process.

The validation team hereby confirms that the process of local stakeholder consultation is observed to be adequate.

During the validation, CL 10 was raised to clarify the of use of the regional language in the invitation to the local stakeholders meeting and the procedure adopted for the identification of the relevant stakeholders

The issue was adequately addressed, resolved and closed in revised PD version 02.1. The resolution of the relevant CL is represented in Appendix II: Resolution of Corrective Action and Clarification Requests.

#### 4. Validation Conclusion

SIRIM QAS Intl. performed a validation of the proposed VCS project “Natural Gas Based Combined Cycle Power Generation, at Kothapeta, East Godavari, Andhra Pradesh, India”. The validation was carried out to independently assess whether the project confirms to the qualification criteria and requirements of the Voluntary Carbon Standard (VCS) 2007.1, including the baseline and monitoring methodology applied. The VCS program provides the standard and framework for independent validation based on ISO 14064-2:2006 and ISO14064-3:2006 standards.

The validation was performed using a risk based approach, the review of the project design documentation and the subsequent follow-up interviews provided SIRIM QAS Intl. with sufficient evidence to determine the fulfilment of the stated criteria.

The project participant is Konaseema Gas Power Limited. The project applies the approved baseline and monitoring methodology “Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas”, AM0029 version 03.

The project activity is a singled VCS project activity by KGPL Limited which involves the commissioning and operation of a new Greenfield 445 MW

natural gas fired combined cycle power plant at Devarapalli Village in East Godavari district, Andhra Pradesh, India. The main purpose of the project activity is to generate electricity through less GHG intensive fuel, such as natural gas (NG), that displaces electricity from an electricity distribution system (Southern Grid) dominated by more GHG intensive fossil fuel fired generating units. The project activity will displace approximately 1,358,857 tCO<sub>2</sub>e of less carbon intensive CO<sub>2</sub> of power annually to the power deficit, more carbon intensive Southern Grid.

The project will result in the reduction of greenhouse gas emissions that are real, measurable and give long term benefits to the mitigation of climate change. It is demonstrated that the project faces an investment barrier that would prevent its implementation without the VCU revenue. Without the VER revenue, the levelised cost is calculated to be 3.29 INR/ kWh which is more costly compared with the credible and feasible baseline alternative of energy generation using coal. Emission reductions from the project are hence additional to any that would occur in the absence of the project activity.

The GHG emission calculations are documented in a complete and transparent manner. The formulae and methodologies for accounting GHG emissions are appropriate and emission factors are deemed to be of sufficient accuracy. The total emission reductions from the project if implemented as envisaged in the PD version 02.1 dated 24 May 2010 is 13,588,570 tCO<sub>2</sub>e over the 10-year crediting period. The emission reductions forecast has been checked and it is deemed likely that the stated amount is achievable on the basis that the underlying assumptions do not change.

The monitoring plan is line with the approved monitoring methodology of AM0029 version 03. The plan adequately addresses all necessary information for monitoring and reporting of emissions reductions due to the project activity. Responsibilities and authorities for project management, monitoring and reporting, and the data quality control and quality assurance procedures have been described in the PD.

An Environmental Impact assessment (EIA) for the project activity has been conducted. The plant has been granted with the environmental clearances and consents as per the requirements of the regulatory authority of the host country. The project is not likely to create any significant adverse environmental impacts. The project complies with all environmental regulations of India. Also the NCDMA of India through its approval letter has confirmed that the project contributes to sustainable development in India. In summary, it is SIRIM QAS Intl.'s opinion that the "Natural Gas Based Combined Cycle Power Generation, at Kothapeta, East Godavari, Andhra Pradesh, India" as described in the PD version 02.1, dated 24 May 2010, meets all relevant VCS 2007.1 requirements, is eligible as The project activity falls under the Mega Project category as it exceeds the limit of 1,000,000 tonnes CO<sub>2</sub> equivalent emissions reductions per year and correctly applies the baseline and monitoring methodology specified in AM0029 (version 3).

As such, SIRIM QAS Intl. recommends the registration of the project as a VCS project activity.

Prepared by :



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(Validation Team Leader)

Approved by :



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Parama Iswara Subramaniam  
(DOE Representative)

## Appendix I

### References

Ref. No.	Document or Type of Information
/1/	VCS Project Description (PD) Version 01 dated 22 <sup>nd</sup> November 2010.
/2/	VCS Project Description (PD) Version 02 dated 18 <sup>th</sup> May 2011.
/3/	VCS 2007.1 Standard, Program guidelines, Registration and Issuance guidance document dated 18/11/2008.
/4/	CDM approved consolidated baseline methodology AM0029 Version03
/5/	List of Sectoral scopes
/6/	Land documents for project activity
/7/	Commercial Operation Date - 05 <sup>th</sup> June 2009
/8/	The Gazette of India, Extraordinary Dt. 29 <sup>th</sup> March 1994 ( <a href="http://www.powermin.nic.in/acts_notification/generating_companies.htm">http://www.powermin.nic.in/acts_notification/generating_companies.htm</a> )
/9/	Notice to proceed to EPC contractor
/10/	PPA
/11/	Undertaking from KGPL that no other form of environmental credits is generated from project and there is no transfer of any equipment.
/12/	Gas Supply Contract with GAIL
/13/	Note on gas availability
/14/	Demand supply data of India -Ministry of Petroleum and Natural Gas
/15/	Electricity Act, 2003, Section 7,
/16/	Efficiency of Power generation using coal
/17/	Life of coal power plant ( <a href="http://www.cercind.gov.in/160502/comp_bidding.pdf">www.cercind.gov.in/160502/comp_bidding.pdf</a> )
/18/	Maharashtra Electricity Regulatory Commission, Wind Project Tariff Order, 18 <sup>th</sup> September 2003 ( <a href="http://www.mercindia.org.in/pdf/Annexures.pdf">http://www.mercindia.org.in/pdf/Annexures.pdf</a> )
/19/	Hydroelectric power plant -average PLF of 60% ( <a href="http://www.sandrp.in/hydropower/crtlenv_isue_wcd.pdf">http://www.sandrp.in/hydropower/crtlenv_isue_wcd.pdf</a> pg. 5, 2nd last line).
/20/	The Base Load Fallacy, Author: Mark Diesendorf
/21/	Atomic energy ACT 1962 ( <a href="http://www.dae.gov.in/rules/aeact.pdf">http://www.dae.gov.in/rules/aeact.pdf</a> )

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/22/	Levelised tariff calculations for Natural Gas
/23/	Levelised tariff calculations for Coal
/24/	Levelised tariff calculations for Diesel
/25/	Tool to calculate the emission factor for an electricity system Version 02.1
/26/	Central Electricity Authority: CO2 Baseline Database for the Indian Power Sector. Version 05
/27/	Third party DPR prepared by TCE consulting engineers dated October 2000
/28/	internal Technical Appraisal report prepared by KGPL dated October 2003
/29/	PPA signed with APTRANSCO
/30/	CERC (Terms & Conditions of tariff) Regulations, 2001
/31/	Estimated from TEC available to other thermal projects
/32/	NG pricing trend available on <a href="http://www.oilnrgy.com/1gnymex.htm#since30">http://www.oilnrgy.com/1gnymex.htm#since30</a>
/33/	Guidelines for Determination of Tariff by Bidding Process for Procurement of Power by Ministry of Power (2005)
/34/	CEA norms for determination of block size capacity
/35/	Notification on operational norms for thermal generation issued by Ministry of Power, 1999
/36/	Review paper by CERC- Formulation of operational cost norms for Thermal Generation by CERC august 2000
/37/	Price Notification No. 7/2001-2002 dated 9 <sup>th</sup> April, 2001 from the Singareni Collieries Co.
/38/	India's Petrol, Diesel, Kerosene & LPG prices published periodically by Reuters
/39/	Annual inflation rates as per IMF Database
/40/	Specific gravity of diesel
/41/	CO <sub>2</sub> baseline database for the Indian power sector, User guide, Version 3.0, December 2007, Central Electricity Authority, Government of India
/42/	Notice Inviting Tender advertised on 01/06/1995
/43/	Invoices raised to the state electricity board by KGPL
/44/	O & M agreement dated 21 <sup>st</sup> July 2009
/45/	CEA Version 05

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/46/	VER calculation spread sheet
/47/	Public hearing on the project activity conducted on 29 <sup>th</sup> September 2000 by Andhra Pradesh Pollution control board
/48/	Environmental Clearance from Ministry of Environment and Forests (MoEF) - 09 <sup>th</sup> January 2001
/49/	No Objection Certificate for land usage for the project activity (letter dated 20 <sup>th</sup> December 2000)
/50/	Environmental clearance from Government of Andhra Pradesh, India (host country) on 16 <sup>th</sup> April 2001
/51/	Invitation to Stakeholders
/52/	Acknowledgement of receipt of notice by relevant stakeholders
/53/	Minutes of the stakeholder meeting and attendance

## Appendix II: Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<p><b>CAR 1</b></p> <p>The documents to demonstrate the following as per VCS guidelines have not been provided:</p> <ul style="list-style-type: none"> <li>• The project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.</li> <li>• The project has not created another form of environmental credit (for example renewable energy certificates).</li> <li>• Project rejected under other GHG programs</li> </ul>	<p><b>1.12, 1.13,1.14</b></p>	<ol style="list-style-type: none"> <li>1. An undertaking to this effect by the PP is submitted to the DoE.</li> <li>2. The project activity is currently in validation stage in CDM cycle. The PP will not claim VCUs for the period when the project is registered in other GHG programs.</li> </ol>	<p>The relevant undertakings have not been provided by the PP and were verified to be appropriate.</p> <p>CAR 1 Closed</p>
<p><b>CAR 2</b></p> <p>The applicability of the following to the project in not justified in the PD with respect to requirements of the methodology AM0029</p> <ul style="list-style-type: none"> <li>• Natural gas is sufficiently available in the region or country, e.g. future natural gas based power capacity additions, comparable in size to the project activity, are not constrained by the use of natural gas in the project activity.</li> </ul>	<p><b>2.2</b></p>	<p>Sufficient availability of the natural gas in the region and future NG based power projects not constrained by the use of natural gas in the project activity are demonstrated in the revised PD Version 2.1. Further a separate note on gas availability is submitted to DOE.</p>	<p>It is evident from the description in the PD that the natural gas is sufficiently available in the region and the future natural gas based power projects comparable in size are not constrained by the implementation of the project activity.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<ul style="list-style-type: none"> <li>Out of the applicable conditions, justification in respect of sufficient availability of natural gas is not clearly spelt out by the Project proponent considering other NG based power plants contemplated in the region by Government of India in the 11th and 12th Five year plan under power development scheme. It is merely indicated that 'even considering other possible demands for natural gas in the area, the supply greatly exceeds the demand for the proposed project'.</li> </ul>		<p>NG based power plants under the power development scheme in the 11<sup>th</sup> and 12<sup>th</sup> five year plans as envisaged by the Govt. of India are based on the estimated potential of NG in the region. It should be noted that new NG based plants of comparable capacities are in various stages of completion and few are already in operation at their rated PLF, this aptly proves that new plants are not constrained by the project activity. Further, sufficient natural gas availability in the region is elaborately addressed in the revised PD Version 2.1. A separate note on gas availability is submitted to the DOE for reference.</p> <p><a href="http://www.petroleum.nic.in/petstat.pdf">http://www.petroleum.nic.in/petstat.pdf</a></p>	<p>Project participant has also received a long-term allotment of natural gas from Krishna-Godavari (KG) river basin in Andhra Pradesh through Gas Authority of India Ltd (GAIL). KG basin as on 2002 has been credited as having the largest gas reserve in the world, with a capacity of 550,000 barrels of oil equivalent per day which is equivalent to 40% of India's current combined oil and gas production<sup>5</sup>. The fact that the PP has sourced fuel from the new source (KG basin) reveals there is no diversion of fuel meant for other power plants. A detailed note on gas availability has also been submitted by the PP</p> <p>CAR 2 Closed</p>

<sup>5</sup> [http://www.ril.com/html/business/exploration\\_production.html](http://www.ril.com/html/business/exploration_production.html)

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<p><b>CAR 3</b></p> <p>It is not evident from the PD that the geographical/ physical boundaries of the baseline grid are clearly identified</p>	<p><b>2.3</b></p>	<p>The physical boundaries of the baseline grid are now clearly identified in the revised PD Version 2.1 (addressed in CAR 2)</p>	<p>The physical boundaries of the baseline grid are now clearly identified in the revised PD Version 2.1. Information on the grid and baseline emissions are taken from CEA database version 5 <a href="http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm">http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm</a> which is publicly available.</p> <p><b>CAR 3 Closed</b></p>
<p><b>CAR 4</b></p> <p>In table 8 under Capital Expenditure of Different Technologies, project cost of oil based power plant is not indicated.</p>	<p><b>2.4</b></p>	<p>In table 8 project cost of 'oil' was missed out due to typo error. However in response to the CAR 5 raised the FO is removed as one of the alternative.</p>	<p>The typographical error has been corrected in the revised PD and the Fuel Oil alternative has been removed.</p> <p>CAR 4 closed</p>
<p><b>CAR 5</b></p> <ul style="list-style-type: none"> <li>The PD does not justify the basis on which all the possible realistic and credible alternatives that provide outputs or services comparable with the proposed VCS project activity are identified. Also the basis on the exclusion of the available alternatives to arrive at the contenders for the baseline has not been</li> </ul>	<p><b>2.4</b></p>	<ul style="list-style-type: none"> <li>The basis of identifying the possible alternatives to the project activity that deliver comparable outputs/services are elaborated in the revised PD Version 2.1 with weblink</li> </ul>	<p>The revised PD identifies the possible alternatives to the project activity that deliver comparable outputs/services to the project activity and is in line with the requirements of the applicable methodology</p>

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<p>substantiated by means of references and supporting documents.</p> <ul style="list-style-type: none"> <li>Further as per the methodology, a sensitivity analysis shall be performed for all alternatives, to confirm that the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions (e.g. fuel prices and the load factor). This has not been done.</li> </ul>		<p>references and supporting documents.</p> <ul style="list-style-type: none"> <li>Sensitivity analysis is now performed for all the identified alternatives including coal based, diesel based and NG based Power Plants.</li> <li>Fuel price, PLF, Heat rate, project cost and GCV are considered by the PP as significant variables and have been treated as “parameters with material impact on sensitivity analysis”. The sensitivity analysis is done for both project activity and alternatives. This is as per applied methodology. From the sensitivity analysis sheet, it may also be found that               <ul style="list-style-type: none"> <li>i) Fuel price of NG has to decrease by 45.5% to reach the worst benchmark (Rs. 2.11) of coal power plant Heat rate of project activity has to decrease by</li> </ul> </li> </ul>	<p>Sensitivity analysis has been performed for all identified alternatives and parameters in the revised PD as per the requirements of the methodology</p> <p>The sensitivity analysis in the revised PD has been done to confirm that the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions (e.g. fuel prices and the load factor).</p>

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<ul style="list-style-type: none"> <li>It is observed that the baseline alternatives presented do not satisfy the requirement of the methodology indicated above fully. For Example, exclusion of NG based open cycle power plant is not explained with any reasons. Possibility and constraints if any in import of electricity from connected grids is not discussed. Technology details, efficiency and technical lifetime are not indicated for plausible alternatives. Reasons indicated for</li> </ul>		<p>45.5%, to at least reach the worst LCoG for coal based power plant of Rs. 2.11/ kWh which is not a realistic one.</p> <p>ii) GCV of Natural gas has to increase by 85% to reach levelised cost of 2.11% which is not a realistic one</p> <p>PLF and project cost has to vary more than the maximum possible variation to reach the worst benchmark of coal based power plant. It may be found in the financial sheets that the financial attractiveness of the project activity is robust to all the variations.</p> <ul style="list-style-type: none"> <li>All relevant baseline alternatives are discussed along with their technology details, technical lifetime and efficiency in the revised PD version 2.1. NG based open cycle has got very low system efficiency as compared to combined cycle and it does not deliver similar output and services, hence this option is</li> </ul>	<ul style="list-style-type: none"> <li>The exclusion of relevant baseline alternatives such as NG based open cycle, super critical technology and import of power from grid has been justified by appropriate links</li> </ul>

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<p>Exclusion of Super critical technology Coal power plants are not convincing.</p> <ul style="list-style-type: none"> <li>Baseline scenario established shall be strictly in accordance with section 5.10 of VCS standard which also stipulates to meet requirement of ISO 14064-2:2006 clause 5.4.</li> </ul>		<p>not considered further. And grid import option is not possible as all the grids face power crisis, experiencing peak shortage as high as 11.7%.</p> <ul style="list-style-type: none"> <li>Coal based PP has the lowest levelised cost of generation Rs. 2.00 /kWh comparatively. So it is identified as the most conservative baseline scenario among the options available to the PP. The rationale behind this conforms to the requirement of ISO 14064-2:2006 clause 5.4. All the applicable alternative scenarios for the project activity's geographical area are considered while identifying the alternatives which are addressed in the revised PD.</li> </ul>	<p>The baseline scenario established, i.e. coal based power generation is most applicable to the project activity after considering all the applicable alternative scenarios for the project activity's geographical area which is in line with the section 5.10 of VCS standard which also stipulates to meet requirement of ISO 14064-2:2006 clause 5.4.</p> <p><b>CAR 5 closed</b></p>
<p><b>CAR 6</b> The common practice analysis in the PD does not substantiate the following with relevant evidences:</p> <ul style="list-style-type: none"> <li>Analysis of other activities similar to the proposed project activity".</li> </ul>	<p><b>2.5</b></p>	<p>Analysis of other similar activities to the project activity is elaborated in</p>	<p>The common practice analysis in the revised PD provides an</p>

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<ul style="list-style-type: none"> <li>“Provide an analysis of any other activities that are operational and that are similar to the proposed project activity. (same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc)”</li> </ul>		<p>the revised PD Version 2.1</p> <p>Other project activities of comparable capacities in the region that are in operation with similar investment climate are Vemagiri (388.5 MW), Gautami (469 MW), and GVK (220 MW). All these projects are in various stages of obtaining carbon credits. Further, detailed analysis is explained in the revised PD Version 2.</p>	<p>analysis of other activities similar to the proposed project activity with relevant evidences.</p> <p>CAR 6 closed</p>
<p><b>CAR 7</b></p> <ul style="list-style-type: none"> <li>In section 3.3 of PD, CERs are mentioned instead of VCUs.</li> <li>In section 3.4 of PD under monitoring Plan, CDM manager has been indicated instead of VCS manager.</li> </ul>	<p><b>3.3 &amp; 3.4</b></p>	<p>Modified accordingly in the sections 3.3 and 3.4 of the revised PD Version 2</p>	<p>The errors have been corrected in the revised PD in the appropriate sections</p> <p>CAR 7 Closed</p>
<p><b>CAR 8</b></p> <p>The Leakage calculations in Section B.6 of the PD are not in conformance with the requirements of AM0029.</p> <p>Leakage calculations in section 4.3 mention <math>88779.51 + 0 = 91525.27\text{t CO}_2\text{ e}</math></p>	<p><b>4.1</b></p>	<p>Leakage calculations have been corrected now as <math>91525.27 + 0 = 91525.27\text{ t CO}_2\text{ e}</math> in section 4.3.</p> <p>In section 3.3, the fugitive CH<sub>4</sub></p>	<p>The leakage calculations in the revised PD are in line with the requirements of the applicable methodology AM0029</p> <p>CAR 8 closed</p>

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
Section 3.3 0.00030 tCH4/ GJ (taken from IPCC)is indicated in section 3.3 while 296 is indicated elsewhere.		upstream emission factor for natural gas is corrected as 296 t CH4/PJ and it is made consistent throughout the PD	
<p><b>CL 1</b></p> <p>Project crediting period start date and Project start date are indicated as same. As per the standards, Project Crediting Period Start Date is defined as the date on which the first monitoring period commences. This may be clarified.</p>	<b>1.6</b>	<p>The project was commissioned in 4<sup>th</sup> June 2009. As per VCS standard 2007, the start date of the crediting period and start date of the project activity are the same which starts from the date of commissioning. First Monitoring period also starts from the date of commissioning.</p>	<p>The explanation provided by the PP is acceptable and hence 4th June 2009 is taken as the start date of monitoring period which is also the date of commissioning.</p> <p>CL 1 closed</p>
<p><b>CL 2.</b></p> <p>Please clarify, The applied methodology has been basically written considering open market / free trade conditions. In case of Indian context where there is some sort of Govt. control in allocation and prioritisation of supply of NG for/among different Industry.</p> <ul style="list-style-type: none"> <li>The underlying policy has Not been discussed with respect to the effect of these policy on baseline &amp; associated</li> </ul>	<b>2.2</b>	<p>In the 1990's, Government of India constituted a 'Gas Linkage Committee' for allocation of indigenously available NG through a mechanism called Administered Pricing Mechanism (<b>APM</b>) (that supplies lower than the market price). As per the Committee, the priority of allocation, at any point of time, was for existing users, primarily to prevent diversion (leakage), to</p>	<p>The explanation given by the PP is acceptable and the supporting references further clearly demonstrate that NG was available in abundance. Also as the PP has decided to invest in II phase NG power plant of 800 MW capacity the allocation of gas is not a barrier to future project activities.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<p>leakage (if any)</p> <ul style="list-style-type: none"> <li>• The allocation of gas (by GOI) has been linked to the availability of Gas in abundance. Please justify / clarify the conclusion.</li> <li>• PD does Not conclusively rule out the possibility of a possible leakage.</li> </ul>		<p>new users at the cost of existing users.</p> <p>And in the early 2000s, market based mechanism (<b>Non-APM</b>) came up, abandoning the APM model allowing the market to determine the price.</p> <p>In the year 2003, project participants had two options viz 1) either to import NG (two active LNG terminals were in operation then) or 2) buy NG from the various middlemen involved in importing NG.</p> <p>From the above, it is quite clear that NG was available in the market at market determined prices. The policy is also covered in the Note on Gas Availability which has been presented to the DOE.</p> <p>Section 2.2 of the revised PD elaborates the abundant availability of NG in the KG basin (Andhra Pradesh). The project plant is fully functional at its rated PLF presently</p>	<p>Monitoring of LNG usage is indicated now in the revised PD Version 2.1, taking in to account any possible effects of leakage.</p> <p>CL 2 closed</p>

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<p>However it has not been demonstrated how LNG would be monitored in case it is used.</p>		<p>and similar new projects of comparable capacity are in various stages of execution with few in operational stage viz Vemagiri Power Generation Ltd (388.5 MW), Gautami Power Ltd (469 MW). This substantiates the claim that new NG power plants are not constrained by the operation of KGPL plant.</p> <p>Future plants not constrained by the existing plant are demonstrated in the note on 'gas availability'. Leakage due to fugitive emissions are only calculated in the PD, however if LNG is used then leakage to that effect will be accounted for. (Monitoring of LNG usage is indicated now in the revised PD Version 2)</p>	
<p><b>CL 3</b> It is noted from PD, that the levelised cost of electricity generation is taken as financial indicator in proving the additionality. However, according to the 'Tool for the demonstration and assessment of additionality, Ver 05.2', Financial</p>	<p><b>2.5</b></p>	<p>Levelised cost of generation (INR/kWh) is used as the financial indicator for the project activity. The basis of choosing it as financial indicator is explained as follow:</p>	<p>The Tool for the demonstration and assessment of additionality, Ver 05.2' recommends a financial indicator most suitable for the project type and decision</p>

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<p>indicator such as IRR, <b>most suitable for the project type and decision context</b> is to be used in the Benchmark Investment Analysis. The methodology 'AM0029 ver 3 para 2' does not indicate any specific indicator and it allows any suitable financial indicator to be used. But under Additionality clause in the methodology (page 3), it is clearly indicated that Option III Benchmark analysis is to be applied as per the latest additionality tool V 5.2 to demonstrate the additionality. PP to clarify and justify the approach of taking levelised cost of electricity generation as financial indicator instead of IRR for comparison and concluding additionality.</p>		<p>Levelized cost of electricity generation is a realistic approach when comparisons are done among different technologies (alternatives) with varying lifetime since it allows to quantify, the unitary cost of the electricity (kWh) generated. The levelized cost of electricity being a mean value, allows the comparison with the cost of other alternatives. It is also important to note that for all power generation projects in India which are evaluated by Ministry of Power, Government of India, levelized cost of generation is the evaluation criteria. It is compared with levelised cost of generation of coal based power plant which is considered as the benchmark.</p>	<p>context to be used. In this case the justification provided by the PP is adequate for establishing Levelized cost of electricity generation is a realistic and most appropriate approach for additionality.</p> <p>CL 3 closed</p>
<p><b>CL 4.</b></p> <ul style="list-style-type: none"> <li>It is not evident in the PD that Natural Gas was BAT (Best Alternative Technology) at the time of the investment decision. Please justify / clarify with appropriate evidences.</li> </ul>	<p><b>2.4</b></p>	<p>The NG based combined cycle technology adopted in the project activity has the highest station heat rate (SHR – 1850 kCal/kWh), further the gas burners employed in the project activity are specially designed</p>	<p>The supporting evidence has demonstrated that NG based turbines based on combined cycle was the Best Available Technology at the time of conceptualisation of the project</p>

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<ul style="list-style-type: none"> <li>Clarify on the basis of arriving at the different lifetimes for the credible options for baseline and project activity with relevant supporting documents.</li> </ul>		<p>that emit very less NOx causing the least environmental damage. (Reference document is submitted to the DOE). The heat rate of the project activity as evident from the DPR is still the best in the market meeting the latest CEA requirements and the PCB norms more specifically NOx.</p> <p>‘Lifetimes’ for the project activity and baseline options are taken from the Central Electricity Regulatory Commission document and the same is indicated in the revised PD version 2.1  <a href="http://cercind.gov.in/160502/comp_bidding.pdf">http://cercind.gov.in/160502/comp_bidding.pdf</a>.</p>	<p>The CERC document provided is appropriate to justify the different lifetimes for the credible options for baseline and project activity</p> <p>CL 4 closed</p>
<p><b>CL 5</b> Pls clarify/Justify the following</p> <ul style="list-style-type: none"> <li>Pls. provide the authentic links and justify that all the relevant parameters for the combined cycle gas plant, coal based plant and oil based plants are in line with EBs guidance, para 6 of annex 58.</li> </ul>	<p><b>2.5</b></p>	<p>The source for each of the parameters considered for both the project activity and benchmark is given in both PDD and the financial sheet.</p>	<p>The parameters and assumptions provided in the revised financial calculation sheets and the PDD have been checked to be according to EB investment guidelines, EB 51, Annex 58.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<ul style="list-style-type: none"> <li>• Pls clarify the basis of including RoE for the calculation of levelised cost as part of expenditure.</li>   <li>• Electricity tariff as per PPA is taken as Rs. 2.43, while levelised cost is calculated as Rs. 2.14/kWh.</li>   <li>• It is seen that depreciation is calculated on the cost of land which is not normally a depreciable asset.</li> </ul>		<p>As per the guidance provided by National Renewable Energy Laboratory - US Department of Energy (<a href="http://www.nrel.gov/analysis/lcoe_documentation.html">http://www.nrel.gov/analysis/lcoe_documentation.html</a>), "Levelised Cost of Energy is a cost of generating energy (usually electricity) for a particular system. It is an economic assessment of the cost of the energy-generating system including all the costs over its lifetime. Since the RoE is part of cost incurred for the generation of electricity, it is considered as expenditure in calculating levelised cost of generation.</p> <p>The levelised cost of generation for the project activity with corrected value is Rs. 3.29/ kWh.</p> <p>The depreciable asset of the project excluding land cost was taken for</p>	CL 5 closed

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<ul style="list-style-type: none"> <li>• Only the cash items of expenditure should be considered for levelised cost whereas Income Tax component, not being an item of charge is also considered as a part of the expenditure.</li> <li>• Discounting is taken in the first year itself whereas as per normal procedure discounting rate is applicable from second year only.</li> <li>• The PP is requested to demonstrate how the debt equity ratio adopted is in line with EB guidance 51 para no. 11. ie., The cost of other debt recently acquired by the project developer and by applying a debt-equity ratio used by the project developer for investments taken in the previous three years.</li> <li>• Please demonstrate how the rate of interest assumed is in line with EB guidance 51 para no. 11 - according to the prevailing commercial interest rates in the region.</li> </ul>		<p>depreciation calculation.</p> <p>PP rectified the error and tax component is removed from the calculation of levelised cost in financial sheet and PD.</p> <p>PP rectified the error and levelised cost of generation is discounted from second year onwards and the same is modified in the financial analysis. The company was established only to implement this project activity and hence question of previous investment doesn't arise. The D/E value is taken from the DPR which was used to make the investment decision.</p> <p>The RBI proposes bank prime lending rates periodically and puts it in its website. The interest rate prevailing during the time of investment decision may be found in <a href="http://www.rbi.org.in/scripts/WSSVie">http://www.rbi.org.in/scripts/WSSVie</a></p>	

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<ul style="list-style-type: none"> <li>Selling price of electricity is taken as Rs 2.43 in the calculation of levelised cost of generation in both Gas and Coal alternatives.</li> <li>Provision exists in PPA provides for third party sale of excess electricity beyond 80% of declared capacity. It is to be clarified why this additional revenue is not considered in the financials in establishing the additionality.</li> </ul>		<p><a href="#">w.aspx?id=6468</a>. So the rationale behind taking the interest rate in this manner is in accordance with para 11 of EB 51 Annex 58. PP rectified the error in the financial sheets.</p> <p>‘Levelised cost of generation’ is the approach followed to prove the additionality of the project. And this approach takes into account only the expense incurred and the revenue stream is not to be accounted for in the calculation of Levelised cost of generation.</p>	
<p><b>CL 6</b> The NIT advertised on 01/06/1995 Indicates the fuel as GAS/ NAPTHA/ LSHS/ Furnace oil based short Gestation period project (for which PP has applied). Whereas Coal based power plant is of separate category (in the same Notice) Long Gestation period project. Accordingly justify / clarify that coal is a realistic baseline in the above context.</p>	<p><b>2.4</b></p>	<p><b>Pre- 2000 scenario</b> Oakwell Engineering Ltd (OEL) was awarded the contract for implementation of 2*100 MW barge mounted furnace oil based power plant in 1996 and the PPA was signed on 1997 valid for 15 years. However the fuel linkage by MoP&amp;NG was ensured only for seven years against the PPA term of 15 years. Later on in 1997 OEL</p>	<p>The historical background of the project from the award of the tender up to the board decision indicate that due to changing scenarios in power sector and regulatory reforms by the host country, coal was a credible option at the time of conceptualisation of the project. Also other projects with similar capacity and investment</p>

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		<p>joined hands with Engineering Power Systems (EPS) and formed EOPL, and subsequently it was approved by GoAP in the same year to implement the project. Due to insufficient fuel linkage (FO allotment for 7 year period against the PPA term of 15 years) and high cost of fuel, a mandatory change occurred with a change of fuel to condensates. In July 1999, Konaseema Power Corporation Limited (KPCL) the power generating company of VBC group had obtained fuel linkage (NG) from Government of India for 0.9 MCMD sufficient enough for 210-220 MW plant. The envisaged fuel (condensates) by EOPL had to be imported on continuous basis which again did not guaranty the fuel security and has got its own associated risks, so the EOPL entered into a strategic alliance with KPCL and formed a new company called KEOPL in 1999.</p> <p><b>Post 2000 Scenario</b></p>	<p>climate have also opted for coal as credible option.</p> <p>CL 6 Closed</p>

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		<p>In 2000, KEOPL approached GoAP and received approval for land based CCGT with revised capacity of 359 MW. MoP&amp;NG allotted additional gas supply for the increased plant capacity on a fall back basis in 2001. Though the fuel supply agreements were signed, its supply could not be ensured by the government within a time frame (as the clause of availability based supply is indicated in the FSA), these developments had made things complicated for the project that has seen several hands changing, inordinate delays in progress and virtually forcing the project developers to look out for other alternatives. Moreover the Indian Electricity Act 2003 that came up in June 03 which is considered as the liberation act for power generating firms (delicensing the power generation) further strengthened the case in favour to look out other means of power generation. Because during that</p>	

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		<p>period, coal based power plants were widely in existent with good fuel supply chain, proven technology and well sought-after means of power generation (refer to AP government power procurement plan for coal power plants). So its clearly evident that coal based power plant was also an alternative available to the PP when the investment decision was taken in 2003.</p> <p>The board decision meeting, held in Oct 2003, clearly evidences that the PP was considering a coal based alternative which was a credible and technically feasible option for the planned capacity. The discussions with the consultant has also been mentioned in the board minutes, which state that the consultant advised the PP to wait for a few years as the CDM specific methodology for NG based power plant was still in conceptualization stage. Also the consultant stated that other similar sized Natural gas power</p>	

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		projects like Vemagiri, Gautami etc. are also awaiting the same.	
<p><b>CL 7</b> Please clarify Section C.2.2.1 indicates the expected starting date of crediting period is the date of registration of the project. Whereas the JMR is taken on a fixed date, It is most likely that the date of registration may not coincide with the date of JMR. PDD does not identify procedures for dealing with possible monitoring data adjustments to handle such exigency. Identical situation is anticipated in the last month of crediting period. Please clarify</p>	<b>3.0</b>	Project start date and crediting period start date for this project activity is the date of commissioning. The plant is equipped with DCS wherein the 'net electricity export' can be retrieved for any time period. However the PP will claim for the emission reductions for the time period coinciding with the JMR.	The explanation provided by the PP is acceptable and the procedure to handle exigencies in the JMR date has been identified.  CL 7 closed
<p><b>CL 8</b> Pls. clarify, Description of Monitoring parameters in the PD mention that The data will be stored for two years after the end of the crediting period or the last issuance of VCUs, whichever occurs later.</p>	<b>3.3</b>	The data will be stored for two years after the end of the crediting period or the last issuance of VCUs whichever occurs later – modified accordingly in the revised PD version 2.1	The error has been corrected in the revised PD.  CL 8 closed
<p><b>CL 9</b> Pls. Clarify</p>	<b>4.3</b>		The revised VCU estimation has accounted for emissions

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
<ul style="list-style-type: none"> <li>In calculation of project emissions, total quantity of gas burnt is computed for net electricity dispatched to grid after deduction of Auxiliary power consumption of 3%. However, it is opined that the emissions caused due to auxiliary power consumption is to be accounted too in the project emission only.</li> <li>Gross station heat rate is taken as 1850 kcal/kwh as in PPA in calculation of levelised cost of electricity whereas in calculation of VCUs the same is taken as 2013 kcal/kwh as CEA Data.</li> </ul>		<p>Emissions due to auxiliary consumption are added to the project emission and revised VCU estimation is indicated in the PD Version 2.1</p> <p>The value of 1850 kCal/kWh for gross heat station rate which is taken from DPR is used for the calculation of Levelised cost of generation and VCU. The same is modified in the revised PD Version 2.1</p>	<p>due to auxiliary emissions</p> <p>Gross station heat rate is taken as 1850 kcal/kwh as in DPR in calculation of levelised cost of electricity and in calculation of CERs which is appropriate.</p>
<p><b>CL 10</b> Pls. clarify the following for Local stakeholders meeting</p> <ul style="list-style-type: none"> <li>It is not evident if the medium used for inviting the local stake holders is the local / regional language</li> <li>It is not evident what procedures were adopted for the identification of the relevant stakeholders</li> </ul>	<p><b>6.0</b></p>	<p>Invitation letters in their regional language (Telugu) were sent to representatives of various stakeholders and copy of the same is submitted to DoE.</p> <p>Local community were identified as</p>	<p>The invitation letters in the local regional language were provided by the PP. Also from the acknowledgment of receipt of notice by the identified stake holders, it is evident that stakeholders invitation was as per the normal practices followed.</p> <p>CL 10 closed</p>

Draft report clarifications and corrective action requests by validation team	Ref. to Section of the PD	Summary of project owner response	Validation team conclusion
		the important stakeholder's as the project activity would have a huge impact on them.	

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